



**YEDITEPE UNIVERSITY**

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**THE PREDICTIVE POWER OF LEARNING STRATEGIES AND CRITICAL  
THINKING TENDENCIES ON HIGH SCHOOL STUDENTS' ACADEMIC  
ACHIEVEMENT**

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## ABSTRACT

### THE PREDICTIVE POWER OF LEARNING STRATEGIES AND CRITICAL THINKING TENDENCIES FOR HIGH SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT

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A person's learning strategy is one of the essential factors that determine the quality of a learning outcome. On the one hand, learning strategy of students in learning process directly affects their academic achievement level according to many educators. On the other hand, critical thinking, as an ability to question and construct the information, is considered as an important part of the academic achievement. Therefore, learning strategies and critical thinking disposition levels of high school students were measured and predictive power of these two variables on academic achievement together was examined. In this research, two validity and reliability scales were applied to the students who are studying at various grade levels in the five different types of high schools. The students' first semester grades were used as academic achievement indicator. The multiple linear regression analysis technique was applied to assess the predictive power of learning strategies and critical thinking dispositions on academic achievement. Variables such as parental education level, school type and gender variables were also analyzed. Simple correlation, t-test, and ANOVA were used in the study. According to the results; learning strategies and critical thinking predictive power in academic success is 15%. A low level ( $r = .19$ ) relationship was found between learning strategies and critical thinking. In terms of gender factor there was a significant difference in favor of females in learning strategies of elaboration, affective and rehearsal. There was no significant difference between 9th, 10th and 11th grade students in terms of critical thinking. Finally, a significant and positive correlation was found between parental education level and students' critical thinking level and learning strategies.

**Keywords:** Learning, Strategy, Critical thinking, Academic achievement.

## ÖZET

### ÖĞRENME STRATEJİLERİ VE ELEŞTİREL DÜŞÜNMENİN LİSE ÖĞRENCİLERİNDE AKADEMİK BAŞARIYI YORDAMA GÜCÜ

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Öğrenme çıktısının niteliğini belirleyen en önemli faktörlerden biri bireyin öğrenme yöntemidir. Bir öğrencinin öğrenme sürecinde kullandığı strateji, birçok eğitimciye göre başarı düzeyini doğrudan etkilemektedir. Öte yandan, bilgiyi sorgulama ve yapılandırma becerisi olarak eleştirel düşünme eğilimi akademik başarının önemli bir parçası olarak kabul edilmektedir. Bu bağlamda bu çalışmada öğrencilerin kullandığı öğrenme stratejileri ve eleştirel düşünme eğilimi düzeyleri ölçülmüş ve bu iki değişkenin birlikte akademik başarıyı ne düzeyde öngördüğü değerlendirilmiştir. Beş farklı lise türünde ve farklı sınıf düzeylerinde öğrenim gören öğrenciler bu araştırmanın ana hatlarını oluşturmaktadır. Öğrencilerin eleştirel düşünme eğilimleri ve öğrenme stratejileri kullanım düzeyleri ölçülmüştür. Akademik başarı göstergesi olarak ilk yarıyıl genel not ortalamaları kullanılmıştır. Öğrenme stratejileri ve eleştirel düşünme eğilimlerinin akademik başarıyı yordama gücünü belirlemek için çoklu doğrusal regresyon analizi yapılmıştır. Ebeveyn eğitimi düzeyi, okul türü, sınıf düzeyi ve cinsiyet faktörü gibi değişkenler de alt düzeyde değerlendirilmiştir. Araştırmada basit korelasyon, t testi ve ANOVA kullanılmıştır. Elde edilen sonuçlara göre öğrenme stratejileri ve eleştirel düşünme akademik başarıyı %15,4 oranında yordamaktadır. Öğrenme stratejileri ile eleştirel düşünme arasında düşük düzeyli ( $r = ,19$ ) ilişki tespit edilmiştir. Cinsiyet faktörü açısından öğrenme stratejilerinden 3'ünde kızlar lehine anlamlı farklılık bulunmuştur. 9. 10. ve 11. sınıf öğrencileri arasında eleştirel düşünme açısından anlamlı bir farklılık tespit edilememiştir. Son olarak ebeveyn eğitim düzeyi ile öğrencilerin eleştirel düşünme düzeyi ve öğrenme stratejileri arasında anlamlı bir ve pozitif bir ilişki görüşmüştür.

**Anahtar Kelimeler:** Öğrenme, Strateji, Eleştirel düşünme, Akademik başarı.

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## LIST OF ABBREVIATIONS

<b>CCTDI</b>	California Critical Thinking Disposition Inventory
<b>CT</b>	Critical Thinking
<b>HS</b>	High School
<b>LS</b>	Learning Strategies
<b>LGS</b>	Liselere Giriş Sınavı (High School Entrance Exam)
<b>UF/EMI</b>	University of Florida/Engagement, Maturity, Innovativeness



## **CHAPTER I**

### **INTRODUCTION**

Learning is a lifelong development process in the psychomotor, cognitive, and affective fields of people both in formal and informal ways. Cognitive learning is a mental process that students use in formal education. In the cognitive learning process, some strategies are used to enhance the quality of learning. These strategies are called 'learning strategies. The role of these strategies in learning is to make the perception, evaluation and coding processes more efficient for learners. These strategies and techniques, used by learners, shape students' specific learning process such as a personalized method.

Each student has a unique and specific learning strategy based on each one's personality. This strategy may vary from person to person according to individual differences. Given that each student's personal learning method is unique like a fingerprint, it is difficult to discover it. For some students may not have discovered their own appropriate learning strategies yet (Pressley & Harris, 1990).

Individuals' choosing different learning strategies indicates the diversity of the human mind and each brain's own unique structure. In this respect, in the 21st century, the field of education supports the learning environments that reveal the individual's potentials. It also liberates students to structure their own learning ways chosen by themselves. Related to this it can be claimed that 'individual differences' has great importance in educational psychology. In this context, when the studies on learning strategies are evaluated, to solve the problems of education, the individuals necessarily gain the skill of using learning strategies (Cano & Hughes, 2000).

The acquisition of this skill by students will allow them to learn on their learning way and affect their academic achievement. Thanks to this kind of work in schools, students who have 'learning difficulties' or who cannot work effectively can be supported to obtain self-confidence. It can also be helpful to eliminate negative attitudes or prejudices about some courses such as Mathematics and English (Güven & Tunçer, 2007).

Another factor that directly affects one's learning is critical thinking. Critical thinking is a habit of mind that related to one's characteristic skill. It is also a liberating force in

education just like the other ways of thinking as reflective thinking, creative thinking and analytical thinking. Critical thinking basically can be thought a questioning mind to test the rightness of information. That is why there is a direct proportion between critical thinking and scientific knowledge. In this context, in order to think critically the mind must be cleared from presuppositions . But, this is particularly difficult in societies where the minds of the individuals are shaped by the cultural taboos. These dogmatic taboos are the cultural barriers to human learning and creativity. They inhibit individual's mental creativity. In this respect, the development of academic achievement and overcoming those mental barriers can be only possible with a critical mind.

In critical thinking, there are some intellectual standards. In order to make a correct decision or judgement, criticism of a subject should base on principles so that critical thinking is a reliable, structured, and competent method of thinking based on criteria and principle. In this context, there are two types of thinking first one is ordinary thinking and the second one is critical thinking. Ordinary thinking is often used in daily life. It is believing in simple information without considering any criteria. In this way, people are also vulnerable to information pollution. (Lipman 1988). Regarding that, the processes of critical thinking and ordinary thinking is explained in the following example:

In a high school history lesson, there will be a comparison between ordinary and critical thinking related to World War I topic.

*The questions of Ordinary Thinking:*

In the World War I what are the fronts of Ottoman Empire? Has the Ottoman State allied with Germany? What is the reason for the Ottoman Empire to go to war?

*The questions of Critical Thinking:*

According to some historians, war happens between soldiers. But in this war, millions of civilians have died. For this, the World War I is not war. What do you think about it?

Some historians say ‘This war is not a world war. It has been in Europe.’ What do you think about it?”

Some historians, ‘This war is not the first world war. Historically, more than 20 world wars have been before just like Rome-Persia wars. Why this war was called the World War I?

As can be seen from the example, critical thinking has an essential importance in reaching the true knowledge. Also, this means structuring and reflecting the knowledge to life. Otherwise, the dead knowledge which is produced by the education system based on conditioning and memorizing will not be beneficial for future generations.

In this study, students' academic achievement is analysed concerning learning strategies and critical thinking. Does the student achieve academic success with pure knowledge memorization or by thinking critically? Answer to this question reveals the level of added value which is produced by education system to the people. It also shows the society's level of development. It is hope that analysis give some idea about quality of the education system.

### **1.1. Research Question**

To what extent do the students' learning strategies and critical thinking dispositions predict students' academic achievement?

### **1.2. Sub-problems**

1. What is the predictive power of students' learning strategies and critical thinking dispositions on academic achievement together?
2. What is the predictive power of students' learning strategies and critical thinking dispositions on academic achievement separately?
3. Is there any significant difference between critical thinking and learning strategies of students according to the types of high schools (Science, Social sciences, Anatolian, Imam Hatip and industrial vocational high school)?
4. What is the correlation between learning strategies and critical thinking of students?
5. Is there a significant difference between learning strategies according to students' gender?
6. Is there a significant difference between learning strategies and critical thinking disposition according to grade of students?

7. Is there a significant relationship between parental (Mother / Father) education level and students' learning strategies?
8. Is there a significant relationship between parental (Mother / Father) education level and the students' critical thinking dispositions?

### **1.3. Assumptions**

Firstly It is assumed that students answered the questions of scale carefully and intimately. Secondly the grade point averages for the first semester in 2018-2019 academic year show the academic success of students. Thirdly; the questions about students' personal information and academic point averages are answered correctly by students.

### **1.4. Limitations**

This research is limited to five different types of high school in Başiskele district of Kocaeli during the 2018-2019 academic year. Moreover, research data is limited to the quantitative data collected through surveys from students.

### **1.5. Purpose of the Research**

The main purpose of this study is to assess the predictive power of students' critical thinking dispositions and learning strategies on academic success. The variability of this prediction was also examined according to high school types, grades, gender and parental education levels. In addition, the students' level of critical thinking disposition and learning strategy were evaluated.

### **1.6. Importance of the Research**

In education, students' ability in organizing their own personal learning methods is important for constructing and making sense of knowledge. Since any information that has no meaning on the student's mind or real life is a waste of time, effort and capital. Thus,

this study aims to reveal the role of critical thinking and usage learning strategies in achievement of public-school students.

Furthermore, although there are several researches on learning strategies at undergraduate level, there are only a few studies have focused on high schools. According to Keskin, (2014), in this regard only 18.9% of the researches are conducted with high school students. This study on high school students will contribute to this academic gap in the literature.

### **1.7. Definitions**

**Learning:** At the field of education; most known, basic and simple definition is: A permanent change in human disposition or capability, by experience, that persists over a period of time and is not simply ascribable to processes of growth (Mayer, 2008).

**Learning Strategy:** The person's thoughts and behaviors that aim to influence the learner's coding process to make quality learning outcomes (Weinstein & Mayer, 1986).

**Critical thinking:** "We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based" (Facione, 1990).

**Academic Achievement:** It is the level of attainment which is reached by the student at the end of the teaching process (Demirel, 2003).

## **CHAPTER II**

### **THEORETICAL FRAMEWORK**

In this section, the concepts of critical thinking and learning strategies are explained from various perspectives. After that, the relationship between learning strategies and critical thinking is explained. The third part is about concept of academic achievement and its relationship between other two variables. In the last section the related literature between 2005-2019 years is evaluated.

#### **2.1. Critical Thinking**

##### **2.1.1. The Concept of Critical Thinking**

The history of critical thinking dates back to ancient Greece. Many definitions were made on this concept which has been discussed since Socrates. It has been studied by various scientists. Although the concept of critical thinking is defined by many scientists, it is seen that there is still no common definition (Genç, 2008). When these definitions are examined, it is seen that some scientists emphasize skill, and some focus on tendency about critical thinking. It is also seen that some thinkers center the situation while some others think the evidence (Eskitürk, 2009).

Ennis (1986) made important contributions about the topic of critical thinking. For the first time He emphasized the concept of critical thinking in education. He defined critical thinking as a type of logical and reflective thinking focused on making a decision on what to believe before deciding what to do.

According to Norris (1985), critical thinking is that people do everything they know and then evaluate and change their own thoughts. Therefore they have no fixed idea about any topic. According to Paul (1995), critical thinking is self-guided thinking that is disciplined and revealing the beauty of thinking. It is the art of thinking on the individual's own thought.

The famous psychologist and educator writer Skinner (1976) also expressed his views on critical thinking. According to him, the concepts such as scientific method, productive

thinking, critical thinking, and scientific thinking have identical meaning, although there are small differences among them.

Dewey (1900) has also explained that critical thinking means the steps of problem solving and scientific thinking. According to him, a process of research that continues with doubt and questioning is the most fundamental element of critical thinking. In this context, while John Dewey considered the critical thinking as a step in the scientific thinking, other researchers considered the critical thinking itself as a way of thinking (Allahverdi, 2009).

According to Lai (2011) the tendency of critical thinking involves cognitive and metacognitive skills which are focused on problem solving. Some of these skills are; thinking, inferencing, using deductive and inductive techniques and decision making. In addition, critical thinking includes metacognitive tendencies such as curiosity, tendency to seek truth, and flexibility. In this context, Lai has Dewey's perspective about critical thinking which is considered as the step of solving scientific problems.

Judge, Jones and McCreery (2009)'s approach about critical thinking is the capability of a person to review his ideas as a result of thinking on his own view to restructure the thoughts. By this questioning, the individual gains the ability to restructure his thinking and perspective in the light of his values and personal life philosophy.

Paul & Elder (2014) describe the critical thinking as a person's intellectual standards. It is improving the individual's quality of thinking procedure by bringing intellectual standards. In this case the person can manage his thinking processes in a more qualified way. Lipman's (1988) definition is parallel with the definition of 'intellectual standards'. But he uses the word of 'criteria'. In this context, accordingly critical thinking is a reliable, structured and competent way of thinking which is based on criteria. He also comparatively revealed the differences between ordinary thinking and critical thinking. The following table summarizes these differences.

Table 1. Lipman's (1988) Comparison of Ordinary Thinking and Critical Thinking

Ordinary Thinking	Critical Thinking
Guessing	Estimating
Preferring	Evaluating
Grouping	Classifying
Believing	Assuming
Inferring	Inferring logically
Associating concepts	Grasping principles
Noting relationships	Noting relationships among other relationships
Supposing	Hypothesizing
Opinions without reasons	Opinions with reasons
Judgments without criteria	Judgments with criteria

The studies conducted in Turkey, İpşiroğlu (1997); Demirel (2003); Cüceloğlu (1995) and Akınoğlu (2001) have also made important contributions about the concept of critical thinking. According to Akınoğlu (2001), critical thinking is a cognitive and affective process and it is a skill based on a rational inquiry in the process of acquiring information of the individual. According to Demirel (2003), critical thinking is a mental process according to the abilities and tendencies of acquiring, evaluating and using the right information. In parallel, İpşiroğlu (1997) argues that critical thinking is an objective and in-depth way of thinking. It is the most advanced way of thinking. In this way, we can distinguish the qualified and unqualified views.

Cüceloğlu (1995) also approaches that issue from a psychological perspective and associates the critical thinking skill with the personal development. According to him, critical thinking is an active cognitive process in which the person, who is aware of his own thinking processes, takes into consideration the others' views.

In order to eliminate the complexity of the definitions on the concept of critical thinking, the American Philosophical Association brought together 46 expert theorists in the Delphi project in 1987 (Demir, 2006). This consensus, led by Peter A. Facione, defined critical thinking as follows. *"We understand critical thinking to be purposeful, self-regulatory judgment which results in interpretation, analysis, evaluation, and inference, as well as*

*explanation of the evidential, conceptual, methodological, criteriological, or contextual considerations upon which that judgment is based. CT is essential as a tool of inquiry. As such, CT is a liberating force in education and a powerful resource in one's personal and civic life. While not synonymous with good thinking, CT is a pervasive and self-rectifying human phenomenon.*" (Facione, 1990, p. 2).

On the other hand, within the Delphi-project, the same team of experts have suggested 7 sub-factors of critical thinking to make it more concrete. These factors are as follows. "*Analytically, open-mindedness, curiosity, self-confidence, systematics and the search for the truth*" (Facione, Facione and Giancarlo, 1998; cited in: Kökdemir, 2003). However, the experts in this study stated that the skills of critical thinking and sub-thinking skills included also cognitive skills, including "*analysis, inference, explanation, interpretation, evaluation and self-regulation*" (Facione, 1998, p. 12).

When the definitions of CT are examined generally, it is understood that it has been taken into consideration since 1900s. However, by the theoreticians, it is not considered an independent thinking style but as a part of problem solving and scientific thinking. After 1950s, it was considered a high-level thinking skill and identified its sub-skills. At the same time, it is emphasized as a necessary for the personal development. Today it is considered as an important component of 21st century skills.

It can be understood from the general definitions, CT has two dimensions. The first is that CT is a cognitive skill that can make mental judgments about any view. The second dimension is that CT includes some metacognitive tendencies such as curiosity, innovation and the search for truth. In this research, the definition of CT of Delphi project will be taken as basis. After that Delphi project's 3-factor summary will be explained in detail which is prepared by the University of Florida.

### **2.1.2. Subfactors of Critical Thinking**

The experts of the American Philosophers Association stated the skills and sub- skills covered by critical thinking within the Delphi project as follows. Those cognitive skills are "*analysis, interpretation, evaluation, inference, explanation and self-regulation.*" (Facione, 1998). These skills are presented in the table below

*Table 2. Skills and sub-skills which are covered by CT (Facione, 1998)*

<b>Skills</b>	<b>Sub-Skills</b>
<b>Interpretation</b>	Categorization Decoding significance Clarifying meantime
<b>Analysis</b>	Examining ideas Identifying-detecting arguments Analyzing arguments
<b>Evaluation</b>	Assessing claims Assessing arguments
<b>Inference</b>	Querying evidence Conjecturing alternatives Drawing conclusions
<b>Explanation</b>	Stating results Justifying procedures Presenting arguments
<b>Self-regulation</b>	Self-examination Self-correction

Rudd, Moore, and Penfield (2002) applied factor analysis (CFA) to the “California Critical Thinking Disposition Instrument (CCTDI)” which is identified seven factors by Peter Facione. As a result, they found that seven factors in Facione's study were not clarified in the CFA analysis. That’s to say, the factors proposed by Facione (1990) (*analyticity, self-confidence, curiosity, maturity, open-mindedness, systematism, and seeking truth*) could not be determined. Therefore, the researchers needed to create a simpler instrument to measure critical thinking correctly. At the study of the Florida University, seven factors of critical thinking disposition in CCTDI are summarized as three structures (*Engagement, Maturity, and Innovativeness*). As a result, the inventory of UF/EMI was developed. It took its name from the university's name and its 3 factors' first letters. Its pilot scheme implemented in 2003 (Irani et all. 2007). In this context, the basis of “*UF/EMI Critical thinking disposition inventory*” is based on “California critical thinking disposition Inventory (CCTDI)” (Ricketts & Rudd, 2005).

In the following these 3 sub-factors of critical thinking disposition will be explained based on the perspective of Ricketts & Rudd, (2005). These 3 factors are also used in analyzing critical thinking in the current study.

#### **2.1.2.1. Maturity**

It refers to a person's cognitive maturity. Cognitive maturity; a person knows that the opinions of others may be more righteous than his own opinions. In this context, the individual knows that there may be more than one truth about any subject. That’s why he respects all views even if he does not agree with others. It uses a realistic reasoning process when trying to make a judgment.

#### **2.1.2.2. Engagement**

Engagement means that the individual is cognitively proactive in a subject. Accordingly, the tendency of CT enables one who is offer new solutions to problems and knows the importance of a good communication process.

### **2.1.2.3. Innovativeness**

Factor of innovativeness measures student's mental inquisitiveness and eagerness to comprehend the truth. The tendency of innovation begins with the individual's being free from fixed thoughts. It is the search for the truth in a sense of curiosity. In other words, it can be called the desire to find the truth. Therefore, critical thinkers have a tendency to see and accept new truths. Such a person aims to find the truth, even if it is contrary to his current beliefs and thoughts.

The fact that the individual has these three tendencies means that he has a positive and constructive thinking skill. It can be said that a healthy and productive mind is only possible by transforming these tendencies into skills used in daily life.

### **2.1.3. Characteristics of Critical Thinkers**

As explained above, critical thinking is a skill and also a tendency. Therefore, first of all it is useful to see the concepts of skill and tendency. After that the characteristic features of a critical thinker will be explained.

CT skill means the ability of a person to think critically with ease and mastery through an intellectual effort. The tendency is more about the predisposition of the person. It means an individual's desire for critical thinking (Zhang, 2003). Tendencies are related to attitudes in human nature and evolve over time by being affected by adults, peers, and environmental factors. One's tendency to think critically is a strong sign of having CT skill. The development of this tendency occurs gradually over time. People with a "low-level" CT disposition are not overly interested in complex problems, questioning judgments, or seeking solutions to problems. The tendency of CT can be considered as the shortest way to acquire CT skill (Irani et al, 2007).

Individuals who have a critical perspective in life are curious people and trust their own reasoning skills. They are flexible to alternative ideas, prone to review their views, and are not fixed-minded (Facione, 1990). For this reason, a person with a critical mind chooses his criteria carefully when trying to obtain an answer to a complicated problem and

rationality treats all alternatives. When making decision, they tend to be self-centered and away from community-centered (Ertaş & Sen, 2014).

Critical thinking skill is mainly related to the individual's mental tendency. Related this, individuals with a 'low level' tendency should be provided with environmental support to acquire this skill. At the same time, the social environment must be suitable and sufficient in order to sustain this acquisition. In this context, the individual's critical thinking skill can be developed and sustained by the support of common interaction areas such as school, family and friends. So that the importance of social environment can be considered as a necessity in gaining critical thinking skill.

Various definitions have been made regarding the general characteristics of individuals with critical thinking skill. According to Ferret (1997), the person who is thinking critically; asks questions, evaluates expressions, curious, investigates new solutions, uses various criteria when analyzing, examines various views and compares them to facts, listens carefully and gives feedback, reaches judgments after reviewing all data, supports their views with evidence, does not accept irrelevant and inaccurate information.

According to Carver (1999), the important characteristics of critical thinkers are as follows; tackle any subject from different perspectives, interpret the topics, make benchmarking according to criteria, concentrate on spending labor.

According to Kökdemir (2000) who adapted the “*California Critical Thinking Tendency Scale (CCTDI)*” to Turkish at the undergraduate level, the following characteristics were found in people. They recognize details among proven events and claims; check the reliability of data sources; have no prejudice; are aware of inconsistent data; have consistent questions; are aware of his own thought.

Fisher's (2011) approach for CT skills are as follows; analyzing; evaluating and producing explanations; clarifying and interpreting; producing arguments; analyzing; evaluating and making decisions; evaluating arguments of different types; defining the elements in a reasoned case; assessing the reliability and acceptability of claims; identifying and assessing assumptions.

As closely related to our topic, on behalf of the opinion of the American Philosophers Association, within the scope of the Delphi project, Facione (1996) argues that the

characteristics of critical thinkers are as follows; they are researcher; look for reasons; are clear in their views; have no prejudice; are honest and clear in comments; have no insist on ideas; have consistent criteria.

In the light of the definitions and features above, it can be claimed that those who use this skill effectively in their lives have more qualified thinking process and have open-door to questioning life (Gültekin, 2016). Critical thinking is an essential necessity in the well-being of the individual and the society as well as helping one to self-actualization.

In a general view of all definitons it is noticed that CT is a high-level intellectual activity. Therefore, it can be said that a person who has critical thinking skill can make an intellectual judgment in accordance with the original criteria of any subject. At the same time, a critical thinker has no dogmatic thoughts and absolute beliefs. He does not think with definite assumptions. Thus, he has an uncertainty about the topics in his mind. Therefore, for a critical mind, the first necessity is cleanining the mind from absolute beliefs which are an obstacle to scientific knowledge.

Actually, the human mind has a determinist structure called 'logic', and it extremely has an original productivity. However, conditioning-based teaching systems kill this ability of the mind over time and replace it with fixed beliefs. It is possible to say that this style of education system results the loss of fertility (criticism) of the mind.

In the following the concept of learning strategies will be examined according to the various perspectives of educators and theoreticians.

## **2.2. Learning Strategies**

### **2.2.1. The Concept of Learning Strategies**

First, it is useful to examine the meaning of the words '*learning*' and '*strategy*'. Learning is an internal action of human nature in the most advanced form even if it occurs in animals as a limited form. Its most general and classical definition is the individual's permanent and tracked behavioral changes in the domains of cognitive, affective and psychomotor. For the Oxford Dictionary (2019) the word "*strategy*" is originally a military term that means "*the process of planning something or putting a plan into operation in a*

*skillful way*”. In this respect, as the shortest and effective way of learning, it is necessary to determine the concept of “learning strategy”. So, in the following, the concept of learning strategies will be explained within the framework of some theorists' views and abbreviation of LS will be used.

Learning strategies are considered as cognitive strategies in the literature. It is essentially based on “*information processing theory*” and is considered in context of cognitive learning (Sünbül, 1998; Güven, 2004). In this context, it has emerged that learning strategies should be combined in a single definition as a formula. Despite the consensus about learning strategies, there is no common definition and classification about it. Therefore different representations of learning strategies have been made in the literature (Güven, 2004). It is possible to attribute the lack of common definition to the differentiation of students' learning outcomes. Because each learning field has different outcomes like cognitive, affective and psychomotor. It can be said that this variation of learning outcomes complicates the defining of learning strategies as a single common form.

According to Lenz (1992), LS are cognitive and behavioral elements that help the one's performance in a learning process. By this way he can get high productivity about the learning outcomes.

Derry & Murph (1986) defined LS as a sum of cognitive tactics. Learner practiced this strategy and tactics to facilitate the acquisition of curriculum. According to Derry (1992), a learner's own plan to realize the learning is the learning strategy that belongs to that person. The important point is to choose his appropriate strategy.

Learning strategies are mental actions to improve students' own learning situations. In this context, strategies are considered as two groups; direct and indirect. “*Direct strategies include memory strategies, cognitive strategies and compensatory strategies, while indirect strategies include metacognitive strategies, affective strategies, and social strategies*” (Oxford, 1990).

According to Arends (1997), learning strategy includes cognitive strategies such as memory placement and retrieval. It also refers to the behavior and thinking processes used by the learner, including executive cognitive processes, affecting learning outcomes.

Learning strategies are behaviors that we use in the learning process without realizing it and aim to affect the learning process (Ellez, 2004). From this point of view, everyone uses their learning strategies unconsciously, but its effectiveness depends on the awareness of learning process.

Robert Gagne, who put forward the first important views on human actions during learning, also defined LS. According to him, “learning strategies are the mental processes that students use for self-learning.” Students need specific behavioral and intellectual processes in order to realize learning. Cognitive learning theories highlight the requirement for the learner to assume the responsibility of learning and to actively participate in the learning process. For example; finding the main idea of a reading text depends on the use of some appropriate strategies. Therefore, studies have emphasized learning strategies in this field (Gagne & Driscoll, 1988).

Bayındır (2008) describes learning strategies as special mental processes used by students to increase the quality of the learning product. These mental processes are short learning paths that can be taught to the student.

According to Weinstein & Mayer (1986), LS are defined as all thoughts and behaviors that aim to affect the learner's coding process. For example, the learner has positive conversations, summarizes a text or reads notes. In all of these activities, learning strategies are called by students to know what, how and when they need to learn and to structure or direct their own learning according to their needs.

The learning strategy is the principles, techniques and behaviors that enable students to put their own learning assignments under their own learning responsibility. For this reason, the individual performs all actions such as preparation, monitoring, and examination strategically (Katims & Harris, 1997). Strategy has a great importance in achieving a learning goal. An appropriately chosen strategy makes it easier for the student to achieve the goal. The purpose of the methods and techniques used in the strategy is to facilitate the realizing of this goals (Tan, 2012). In this context, the primary aim of the learning strategy is to facilitate the students choosing, organizing information and integrating them to substructure of mind. This process is the main argument of constructivist learning model.

In summary, these definitions show that the LS are basically derived from the “cognitive learning theory”. According to “cognitive learning theory”, learning strategies can be defined as the most efficient short way followed by the student who takes responsibility of learning in the process of coding information. This process varies that depending on the learner’s mental structure. It includes the person’s all cognitive and metacognitive behaviors. For this reason, effective learning strategies directly affect the quality of the learning outcomes. Learning strategies can be considered as ‘the royal road to knowledge.’

In the next title 5 major models of LS will be explained.

## **2.2.2. Major Models of Learning Strategies**

In the literature, it is observed that learning strategies are classified by researchers in various ways. The most widely used classification of the learning strategies in the field are as follows.

### **2.2.2.1. Gagne and Driscoll**

Gagne & Driscoll (1988) are among the important researchers in this field and have identified 5 learning strategies that affect student achievement based on the theory of information processing in their extensive research. These attention strategies are to increase storage in short-term memory, to strengthen coding, to facilitate recovery, monitoring-managing strategies. Together with these; they also stated motivation strategies that provide interest, self-confidence and inner satisfaction.

**a. Attention Strategies:** These are some signs in the study texts that will provide attention. Techniques such as underlining keywords and taking notes on the page edge are some examples of it.

**b. Strategies to increase short term storage:** Data received with sensory organs first comes to short-term memory and is processed. The retention time here is short. Therefore, techniques of reducing data size can be used by mental repetition, grouping, or graphing. The purpose of these techniques is to reduce the information unit.

**c. Strategies for enhancing coding:** Summarizing, note-taking, information mapping, scheduling information are used. The aim here is to ensure the permanence of information.

**d. Strategies for facilitating recovery:** Recovering information from long-term memory for use. It involves strategies such as establishing simulations or associating with an item from daily life and asking questions to himself about the subject.

**e. Monitoring-managing strategies:** The learner is aware of his own learning and thinking methods, thinking and controlling his own learning processes. The individual should take an active part in this process.

The strategies of interest, motivation and self-confidence that Gagne presents in his classification, as addition, can be evaluated as affective strategies.

#### **2.2.2.2. O'Malley et al**

O'Malley et al. (1985) grouped the LS into 3 groups as “cognitive strategies, metacognitive strategies and social affective strategies”. They categorized each group within itself.

**a. Metacognitive strategies:** These activities begin to be implemented before the topic and continue throughout the learning process such as preparation and pre-organizers, direct attention, selective attention, self-direction, self-monitoring and examination.

**b. Cognitive strategies:** Mental activities in the learning process are such as repetition, grouping, note taking, making inferences, reassembling, simulation, presentation, structuralization, meaning (elaboration), transfer, inference techniques.

**c. Socio-affective strategies:** This is the relationship established with peers to improve the quality of learning. It includes activities such as peer learning, collaboration, external motivation and asking questions.

O'Malley et al. are important in making the first classification in this field. Basically, the distinction between cognitive and metacognitive as major factors contributed greatly to learning strategies.

### 2.2.2.3. Pintrich, Smith, Garcia & McKeachie

The classification of Pintrich, Smith, Garcia & McKeachie (1991) is one of the important and extensive researches in this field.

Pintrich et al. have conducted a more comprehensive study on classification of self-regulated learning strategies. The “Motivated Strategies for Learning Questionnaire (MSLQ)” developed by Pintrich et al. (1993) was adapted to Turkish by Karadeniz, Büyüköztürk, Akgün & Çakmak (2008) and used in many studies at primary, secondary and undergraduate levels. This classification shows great parallelism with Weinstein Mayer's classification. But Pintrich also added resource management. The classification of Pintrich et al. (1991) is summarized briefly and showed in the following two tables.

Table 3. *The Classification of Learning Strategies of Pintrich et al. (1991)*

Pintrich, Smith, Garcia and McKeachie MSLQ (1991)	Rehearsal strategy Elaboration strategy Organization strategy Monitoring strategy Resource management strategy
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The sub-factors of those strategies' are given the following Table 4.

Table 4. *The sub-factors of Classification (Pintrich, 1991).*

Cognitive Strategies	Rehearsal Strategies Elaboration strategy Organization strategy Critical Thinking strategy
Monitoring understanding strategies (Metacognitive Strategies)	Planning Monitoring Organization
Resource management	Time and environment Effort management Peer learning Help seeking

When we look at both tables, it is seen that there are 3 main factors of classification. The sub-factors of the strategies for monitoring understanding seem to be similar to Gagne's metacognition strategies. For this reason, Pintrich et al.'s research suggests that learning strategies are basically divided into cognitive and metacognitive as in other classifications. In addition, it includes resource management strategies.

#### 2.2.2.4. Oxford

Oxford (1990), classified learning strategies into two main groups; direct and indirect learning strategies in his studies on foreign language learning strategies. “*Direct learning strategies* are memory strategies, cognitive strategies and compensation strategies. *Indirect strategies* are metacognitive strategies, affective strategies and social strategies.”

Table 5. Oxford's Taxonomy of Learning Strategies (Oxford, 1990)

Direct	Memory Strategies
	Cognitive Strategies
	Compensation Strategies
Indirect	Metacognitive Strategies
	Affective Strategies

Oxford included many tactics and techniques for the effective use of these strategies in his extensive research. The outline of the classification is as given above.

#### 2.2.2.5. Weinstein & Mayer

Weinstein & Mayer (1986) have conducted the most comprehensive studies in this field. They identified the cognitive part of learning strategies as repetition, elaboration and organization strategies. They also reintroduced three-step strategies into basic and complex issues and adapted them to this three-step classification. In addition, They provided a more concrete and simpler picture by adding cognitive monitoring and affective strategies. Although it consists of 8 categories in total, in substance it is a 5-digit classification.

Techniques at each step are aimed at facilitating the coding process of information and improving the quality of the learning product. The following table shows these strategies.

*Table 6. Weinstein and Mayer (1986) Learning Strategies Division*

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Basic <b>Rehearsal</b> Strategies
Complex <b>Rehearsal</b> Strategies
Basic <b>Elaboration</b> Strategies
Complex <b>Elaboration</b> Strategies
Basic <b>Organization</b> Strategies
Complex <b>Organization</b> Strategies
Monitoring Strategies
Affective Strategies

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In the following years, Weinstein (1988) simplified this classification a little bit. Güven (2004) states that basic and complex strategies are combined into a 5-factors summary classification. This 5-factors classification is used in the literature in Turkey. Therefore this study is based on that classification of 5-factors. The five factors in the table below will be discussed in detail.

*Table 7. Weinstein's (1988) Learning strategy*

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<b>Factors</b>	<b>Brief Explanation</b>
1. Rehearsal Strategies	Repeat reading, taking notes, underlining
2. Elaboration Strategies	Associate and update with previous information
3. Organization Strategies	Editing information, linking information sets
4. Monitoring Strategies	Supervising, organizing and executing the learning
5. Affective Strategies	Focus, concentration and motivation

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### **2.2.3. Learning Strategies 5-Factors**

In this section, the sub-factors in the scale which is used in this study will be explained in detail.

#### **2.2.3.1. Rehearsal Strategy**

Repetition strategies extend the retention time of information received from sensory organs in short-term memory and make it easier to remember by coding into long-term memory (Harris, 1991). According to “information processing theory”, short-term memory has limitations. In order to process the data, which is received with sensory organs, it must be kept in mind for a while. The repetition strategy is utilized to store or memorize information received in the mind for a short time. Repeat strategies are used to store information such as person names, names of important cities of a country (Senemoğlu, 2016). With the rehearsal strategy, students emphasize the important points and memorize the preliminary information which is required for upper learning.

Schunk & Zimmerman (2003) used similar expressions about repetition strategies. Re-reading the information to be memorized, underlining or hanging on the wall to read at certain intervals are techniques that is used in this strategy. These techniques are very effective for memorization. It is used extensively in foreign language learning processes.

Related to this, Weinstein & Mayer (1986), who made important contributions to learning strategies, divided the repetition strategies into two parts as basic and complex. Basic iteration is simply repetition. Data is repeated as it is. In complex iteration, the learner adds meaning to the existing knowledge. To recall complex information, it is necessary to perform a complex iteration (Weinstein & Mayer, 1986).

According to the results of the researches, if rehearsal strategy taught by teacher the primary school children can use it. However, these students may have problems in obtaining the necessary parts of the text while using the rehearsal strategy. After the age of 12, it was observed that secondary school students could utilize these strategies independently (Weinstein & Mayer, 1986). It can be understood that repetition strategies are easy for all learners to use because they do not need much cognitive skills. For this reason, it is a highly preferred strategy by many students.

### **2.2.3.2. Elaboration Strategy**

The elaboration strategy consists of summarizing, interpreting and annotating to relate new information to previous information. It is like an interpretation process. In this process, the student calls the information before long-term memory and integrates it with the new information in the processing memory (Weinstein & Mayer, 1983). Disclosure strategies are used for complex units of information. It is about how new knowledge can be associated with existing knowledge through various techniques. Techniques such as summarizing with new sentences, using analogies and interpreting are used to implement interpretation strategies in any subject (Weinstein & Mayer, 1986). Students use these strategies when summarizing a particular topic or recognizing the primary idea of the topic. In this way, the concepts of the subject become internalized by the learners (Pintrich et al, 1991).

The other elaboration technique is “Questioning”. In this method the learners time to time ask questions about the relationship between the subject and the main idea of the text. With this questioning, students make contact the relationship between the knowledge in theoretical text and real-life application (Schunk & Zimmerman, 2003). For this reason, elaboration strategy means more mental activity for students than rehearsal strategies. Because the student thinks about the information and add to it with the specified methods (Özer, 2013).

The elaboration of knowledge is a subjective process for everyone. Individual makes small additions to the information according to their prior knowledge and previous experiences. The learner's own original sentences may be a good example at a summary. On the other hand, it is possible to think of the elaboration strategy as a cognitive skill at the comprehension level of knowledge in Bloom's taxonomy.

### **2.2.3.3. Organization Strategy**

Reorganizing and structuring the long-term memory information or the information to be learned is called Organization. It is a learning process in which students are active and exerting high effort. In these strategies, it is necessary to comprehend the information. It helps learners to make connections between information units and choose the appropriate

information. Grouping method is used extensively in organizational strategies. Outlining the subject, selecting the primary purpose of the writing, creating information schemes and concept maps, scheduling are some methods used in organizing strategies (Pintrich et al., 1991).

Outlining and editing the content of a topic is one of the most common ways to achieve these objectives. Therefore, there are two goals that regulation strategies serve. These are choosing information transferred from the working memory and structuring the relationships in the working memory (Weinstein & Mayer, 1986).

Organizational strategies enable to reorganize and restructure the knowledge. Among the various examples given in the material, those with common characteristics are grouped. It is used to sort words by considering the integrity of meaning or to rearrange something complex. The simplest organization strategy used for basic learning is clustering (Güven, 2004). Commonly used techniques for organizing complex topics are learning strategies such as creating schemes, tabulating, outlining the topic (Tunçer & Güven, 2007).

In general, students with low levels of success and younger ages use regulation strategies less. However, higher-level learners and older learners use regulation strategies more (Senemoğlu, 2016).

#### **2.2.3.4. Monitoring Strategy**

The monitoring of understanding is that the individual in the learning activity sets specific goals and follows the process in reaching these goals in all aspects. During this monitoring, the student follows the level of achievement of the objectives. If necessary, it manages the process with different techniques by defining new strategies (Weinstein & Mayer, 1986). The strategy of monitoring is related to metacognition. Metacognition is to understand or to be informed of how you have learned. In metacognitive strategies, the learner determines his / her cognitive system, mind structure and working style for more productive learning and works (Senemoglu, 2016). For example, monitoring the attention during a course or reading a book, periodically self-questioning and testing techniques are important activities for the strategy of monitoring. It also includes monitoring strategies to keep time and speed under control in an exam (Pintrich, 1999).

Monitoring is one's reflection on his/her own learning procedure. The strategy of monitoring understanding is that an individual can see and control his or her own learning process from the outside in relation to the internal intelligence in multiple intelligences. Therefore, it can be said that it is a metacognitive strategy, not a cognitive one. This strategy contributes to increasing the quality of learning by focusing on areas that need to be repeated in the learning process or by removing insignificant parts. It is an essential part of the process of learning.

#### **2.2.3.5. Affective Strategy**

There are motivational and affective barriers that occur in the learning process which affect the learner's achievement negatively. Affective strategies help to remove these barriers (Senemoğlu, 2016).

Affective strategies help to build and keep inner and outer environments that are essential for efficient learning. It is not responsible for the acquisition of direct knowledge or skill. However, it contributes to the formation of the internal situation in which an effective learning will be realized. Gathering attention, attitudes, motivation and anxiety are some of the affective strategies (Weinstein & Mayer, 1986). In this context, there are some examples of affective strategies to be alert to all kinds of stimuli coming from outside and likely to prevent learning, to maintain concentration, self-motivation, self-reinforcing against failure anxiety or self-reinforcing to eliminate anxiety (Weinstein & Mayer, 1986).

Attitude is another phenomenon that has an important place in affective strategies. If a student has a negative reaction towards a school or a course, it is destined to fail. Therefore, the individual should first of all get rid of these negative attitudes. The school should develop positive attitudes towards the teacher or the lesson and avoid negative thoughts. This change of attitude in the context of affective strategy will help the student to achieve success after a while (Özer, 2013).

Anxiety is another important factor that is affecting success. Very high level of anxiety about courses and exams affects student self-confidence negatively (Güven, 2004). Many students spend their interest and attention on criticizing themselves because of their anxiety about course success. This leads to a lack of interest and motivation and negatively affects

the success of the course (Weinstein & Mayer, 1986). An important technique used to cope with failure anxiety is to give the student the level of tests that he or she can achieve. When the student sees that he succeeds, the anxiety level decreases (Senemoğlu, 2016). Researches show that moderate anxiety and success have a positive correlation with each other. Too low or too high anxiety has a negative effect. Therefore, general arousal state of students' medium level is the optimum level for them to support their motivation.

As it is known, human nature as a psychological being creates subjective meanings to the stimulants around it. If these meanings are negative like a prejudice, they create cognitive barriers between the individual and object. The individual's belief of failure or prejudice about any course blocks his success that may potentially achieve. Learned helplessness, self-fulfilling prophecy and anxiety, can be given as some examples. Although the learner has potentials and many opportunities, he cannot overcome the affective disability and get out of the current situation. The anxieties of English and Mathematics which are created by many students can be evaluated in this context. At this point, by using those affective strategies, learner can get rid of motivation of failure.

In next 3 titles the study's dependent variable, the academic achievement and its relationships with LS and CT will be explained.

### **2.3. The Concept of Academic Achievement (AA)**

Human resources can be thought the most important factor in a country's progressive development. For this reason, schools' general aim is to train successful and well-equipped individuals in all aspects (cognitive, affective, psychomotor) in the long term. But generally, the expectation of families and the society is only academic achievement of the individual. Because of shaping the personalities and futures of children, academic achievement is considered very important for families and their environment.

Success is the progress towards achieving a desired result (Baymur, 1993). Academic success is student's level of competency in achieving the goals and aims as a result of curriculum (Demirel, 2003). In this context, the test scores determined by teachers in order to measure the skill and knowledge level in the courses at school are called "academic achievement (Carter & Good, 1973).

Greenwood Dictionary of Education defined the term as, “*Academic achievement is the attainment of knowledge, competencies, and higher-level status, as reflected in grades, degrees, and other forms of certification or public acknowledgement*” (Collins, & O’Brien, 2011). AA is accepted as the result of learning. It is commonly believed that AA expresses how well a student accomplished his duties. For this reason, academic achievement is commonly measured by tests, exams, and other mental performances. (Ward et al. 1996).

With the introduction of new teaching programs in our country, measurement and evaluation processes have been changed. In this system in which the constructivist approach is dominant, the evaluation with a grade score is insufficient in schools. In this process, the criteria such as the individual characteristics of each student, giving feedback to students and parents should be actively used. Therefore, complementary assessment tools such as portfolio, performance evaluation, self-evaluation, peer evaluation, rubric, project, concept maps, etc. have become a requirement in the programs applied in the assessment of students (Sezer, 2006).

These alternative measurement tools make the evaluation of academic success more accurate. However, it can be said that in the central exams which are based on only multiple choice type of questions lead students to memorize the knowledge. This makes it difficult to measure students’ variety of skills. Thus academic achievement scores may not be a clear indicator of student abilities. For example, the low academic success of our country in the PISA exam is significant. Therefore the students who study according to test technique based on memorization of information fail in skill-based exams.

In the following, the association between academic success and critical thinking and learning strategies will be examined.

### **2.3.1. Academic Achievement and Critical Thinking**

As stated in the previous parts, CT is a habit of mind. Thus, the tendency to think critically is mostly related to individual freedom. It is very difficult for someone who is under mental pressure to think critically. Minds structured with dogmatic thought patterns from an early age cannot have a critical view. In this respect, a person's critical thinking tendency is an indicator of his cognitive productivity.

Thinking skill is a human behavior that can be taught and developed. Educators are aware that CT should be one of the cornerstones of education. If the individual wants to get rid of the negative impacts of advertising and propaganda in his daily life, he should think critically. In addition, he has to think critically to be an individual who cannot be deceived easily, who can distinguish good from bad and think healthy. In addition, CT contributes to the development of the individual's thoughts and being much more productive (Evcen, 2002). The act of thinking is not only a desired activity in schools where formal education is held. CT is a problem-solving method, which is part of our daily life. Students' quality of life can be improved with critical thinking education. Through critical thinking, individuals manage to solve their problems and can lead their lives happier (Boostrom, 1992).

Today, countries without critical and creative thinking are not accepted as a developed society. For a society, the ability to produce original and new information for the future is emphasized instead of the knowledge of the past. The way to produce original information is to actively use critical thinking skills (Demirel, 1993).

According to Ennis (1991), in today's society, people should get knowledge about different discourses and be able to look critically. As stated in Chapter 1, some features of CT according to Ennis are as follows: focusing on the subject, analyzing discussions, asking and responding explanatory and challenging questions, questioning the reliability of the source, judging and concluding data, evaluating forecasts and communicating with others. Students should be able to compare different ideas. Therefore, the data that are not compared is far from providing realistic information.

A critical mind that practice these skills will also be a source of academic knowledge. The fact that academics are critical thinkers supports this claim. In this context, it can be said that AA and CT have a strong relationship.

### **2.3.2. Academic Achievement and Learning Strategies**

In the studies conducted in Turkey, academic achievement is stated to be affected by 3 factors; originating from student, school and family (Polat, 2009). In this section, the relationship between the use of student LS and AA will be examined.

The purpose of the learning strategy is to make easier selecting, coding, acquiring, organizing and integrating new information for learners. Also developing their affective skills by their metacognitive awareness (Weinstein & Mayer, 1986). Accordingly, a simple definition of learning strategy is to facilitate the self-learning of the individual with some techniques (Özer, 2002).

Learning strategy is the way of how people learn and use the information. Students use learning strategies because of helping them to discover knowledge and solve problems. Students who do not use learning strategies are generally passive learners and eventually fail at school. Students using learning strategies become active learners and focus on how to use what they learn for academic achievement (Pearson, 2009).

Researches on the use of LS and AA have showed a strong relationship between learning strategies and academic success. It is also clear that the students who are trained on learning strategies are positively affected to be more successful about academic achievement (Sünbül, 1998). Accordingly, the learning strategies increase students' self-confidence. They take liability for the education process. Thus, students begin to see the most effective and sufficient learning situations for them. By self-assessment of learning pathways, they realize their own strategies for academic achievement (Talu, 1997). Students need to gain the ability to learn alone and monitor their learning to be successful in the formal education process and afterward. In this way, informing students about learning strategies like types, features and usage areas will affect their academic achievement positively (Güven, 2004).

Learning strategies are the most convenient way to provide a desired level of academic achievement. The student who is using the appropriate learning strategies, makes his learning easier and get permanent knowledge. In this regard, students need to know their own learning strategies at all levels of education (Çelikkaya & Kuş, 2010). Learning strategies not only provide easy and permanent learning, but also increase the productivity of person. Özer (2002) states that students who are informed of their learning strategies will become conscious students. Therefore, they gain the quality of independent learning and enjoy learning process. This will also prepare students for lifelong learning processes after school.

In this context, LS provide a high level of positive contribution to learner's academic achievement by structuring knowledge. Regarding this, quantitative investigations in Turkey and in the world show that there are strong and significant positive relationship between LS and AA.

#### **2.4. The Relationship between Critical Thinking Disposition and Learning Strategies**

As explained previous parts, CT is a habit of mind that one thinks according to objective criteria. It is the individuals' characteristic feature as a high-level thinking style. In this context Fisher (2011) prepared an arrangement for critical thinking skills. The information related to the CT was presented previous parts. In summary the basic skills are analyzing, evaluating and producing explanations; producing arguments; clarifying ideas; making decisions; identifying the reasoned case; judging the acceptability of claims.

LS were explained as the most effective and short way used by the individual in the learning process. These strategies which are used to acquire the learning object in a short and effective way, are generally categorized as; repetition, interpretation, organization, monitoring and affective strategies. Therefore Pintrich et al. (1991) have evaluated the CT tendency as a part of learning strategies. For him the 4th part of learning strategy is critical thinking. Thus, according to him critical thinking is a learning strategy. On the other hand, Garcia & Pintrich (1992) have conducted a research in the context of "*correlates of critical thinking, on account of motivation, use of cognitive learning strategies, and classroom experiences.*" The results showed that there is positive and significant relationship between motivation, deep strategy use and motivation at biology, social sciences and English. While English students had the most significant level of critical thinking, biology students had the lowest level. This result is probably related to the nature of biology domain which is concerned the memorization of knowledge. Also, the planning, regulating and monitoring strategies are more important than motivation in critically evaluating. Elaboration strategies (like summarize, analogies and aspects of coursework) have positive relation with critical thinking. Other important result is that there was no correlation between rehearsal strategies and critical thinking. As a result of this, it can be claimed that rehearsal strategy does not improve or reduce the level of critical thinking. Rehearsal strategy is required for critical thinking but it is not adequate. In the context of the data, the

method of collaboration and discussion with other students may promote critical thinking effectively and also perceived as a “force” for students to think more critically.

In another research Walker (2003) also examined the relationship between active learning strategies and CT. In this study, questioning, written exercises, discussion and debates techniques are used. According to research results were not useful for all grades, but these learning strategies can be used to facilitate critical thinking. By these techniques learners’ critical thinking level can be developed.

Nelson & Crow (2014) investigated “*if active-learning strategies improve students’ critical thinking ability*”. It was conducted with 190 physical education students. In the study, active learning techniques that improve critical thinking were used. Mainly case studies and small discussion groups were conducted to participants. Those process included case studies with problematical conditions, analyze and examine the cases, and then making decisions about possible solutions. Results demonstrated that the all group students have critical thinking skills. But the active learning strategies didn’t play an important role at this improvement. Thus, this study’s data may support to develop the students’ critical thinking skills with well-established service-learning experiences.

In addition to that, Bean (2011) focuses active learning techniques as discussion groups, case studies, role-playing stretches thinking skills. In this way, the capacity of the learner’s interpretation, draw conclusions and judgment skills increase. Because learner’s mentation moves from passive learning to active learning. Burbach, Matkin & Fritz’s (2004) research findings also support that active-learning strategies (as small groups, scenarios, case study, etc.) improve the critical thinking skills. These skills are predicting judgment, problem solving, decision making and creativity. From a wider perspective Tsui (1999) claimed that studying on a group project or presenting a subject in front of the class provide developing the critical thinking skills.

In the mentioned two studies above, there are some applications based on active learning. These applications include problem solving, case studies and discussions. It can be said that these teaching techniques are strongly related to learning strategies. Because, in these techniques, individuals have to use processes such as meaning, organizing, repeating and monitoring their own situation to make case study, discussion and problem solving.

Regarding this issue Ocak & Bulut's (2017) study on undergraduate students in Department of Social Studies Education sheds light. The sample of the research consists of two classes from each grade level selected randomly. "California Critical Thinking Inventory" and "Learning Strategies Scale" were implemented. According to the findings, students who have high level of CT tendency use more often facilitating recovery and executive cognition strategies than students with a low level of CT tendency. In this context, the researchers concluded that there was a positive medium-level association between prospective teachers' CT dispositions and usage of LS.

Therefore, when the relationship between CT and LS is considered in the context of these studies, it is seen that there is a common view. Especially the research of Pintrich and others's (1991) view is that *the 4th factor of cognitive learning strategy is critical thinking*. Garcia & Pintrich, (1992) findings showed the positive relationship between these two factors. Also other quantitative researches, shown above, support this positive correlation.

## **2.5. Review of Literature**

In this section, learning strategies, critical thinking, and the impacts of these two factors on predictive power for academic success are reviewed in the manner of criticizing and evaluating the literature. Regarding that, there will be three title to explain the relationships of those three variables of CT, LS and AA.

### **2.5.1. The Relationship between Academic Success and Critical Thinking**

In studies critical thinking dispositions of students were examined from various aspects. One of them is the correlation with academic achievement. Previous studies conducted between 2005-2019 years will be evaluated according to topic of this title.

The research of Semerci (2005) is about "the influence of the critical thinking skills on the student's achievement". In the study an experimental method prepared and totally 50 students participated this study. Consequently, the experimental group students who used critical thinking skills were more successful than the other group.

Akbiyik & Seferoğlu (2006) investigated the relationship between mathematics achievement and critical thinking tendencies in a study conducted on 71 randomly selected 9th grade students at TED Ankara college. In the study, "Critical Thinking Trends Scale" was used. According to research, a positive relationship was observed among students' mathematics achievement and CT dispositions. In this context, students with high critical thinking tendencies are academically more successful than students with low critical thinking tendencies. In this study, physics, chemistry, mathematics and geography course achievements were also discussed.

The research conducted by Alkaya (2006) aimed to reveal "the effect of science teaching based on critical thinking skills on students' academic achievement." In this study, critical thinking skills were used together with the success teams' technique of student teams. It was realized in two 4th grade branches in a primary school in Mardin district. 40 students from 4-A branch were selected as experimental group and 38 students from 4-B branch were selected as control group. It was observed that, techniques of teaching based on critical thinking skills provided a significant increase in academic achievement compared to traditional teaching.

Koray, Köksal & Özdemir (2007) studied about "the effect of creative and critical thinking-based laboratory applications on academic achievement". The research was conducted on 94 prospective teachers. After that experimental group become successful in terms of academic achievement.

Bessick (2008) prepared a master's thesis with an experimental method about "the relationship between critical thinking skills and academic achievement." As a result, after the end of 13 weeks, there was found no significant relationship between CT and AA.

Another research examined 1196 first year college students. Its problem is the interrelation between critical thinking disposition and perceived academic success. In the study conducted by Stupnisky et al. (2008), it was observed that students' critical thinking dispositions predicted academic success. In addition, it was observed that academic control had a stronger impact on students' grade point average than critical thinking disposition.

Eskitürk (2009) studied the "effect of cooperative learning activities based on critical thinking skills on academic achievement level in Social Studies course". The students

selected from Malkara 75. Yıl Primary School 4/A and 4/B classes in Tekirdağ Province. Thus, the quantitative findings were checked and supported qualitatively. As a result, there was a significant positive variation in favor of the experimental group. The graphs showed that the total scores of the students increased from 60.76 to 74.96 in the experimental group. Its meaning is that the students' academic achievement increases regularly step by step. We can say that gaining of critical thinking skill is effective on the success of the students and increasing of the scores. Relatedly results match up with Alkaya's (2005) research results of "the exam achievement of experimental group which was applied critical thinking training program, showed positive development."

A study about mathematic achievement was conducted by Kayagil (2010). According to the study, conducted with 360 students in Ankara. Results showed that the students' critical thinking skill levels are inadequate. It is stated by the researcher that in terms of mathematics achievement; gender, age and socio-economic level contribute significantly to the variance in students' critical thinking skill levels. In this sense, 18% of the variance in students' critical thinking skill levels was explained by independent variables. The variables contributing to the explanation of the variance are mathematics achievement, house of tenant-owner status and age. Other variables do not contribute significantly to explaining variance. In this context, it is understood that mathematics achievement of students is a predictor factor in determining critical thinking skill levels. Its findings are notable about affecting math success to CT disposition.

Ayrancı (2011) studied "The relationship between critical thinking skills and mathematics achievement of primary school students." In this research, mathematics achievement test, Cornell Critical Thinking Inventory, mathematics attitude scale, SBS (central exam) math achievement scores, math report notes were used. The best predictors of the critical thinking test total scores of students were determined as SBS mathematics achievement scores, socio-economic level and mathematics achievement test. In this regard CT level predicts SBS mathematics achievement. Ayrancı (2011) states that critical thinking and mathematical thinking are related. However, no data were found to predict mathematics report notes. Therefore, it can be interpreted that the teachers have inadequate critical thinking skill. In the context of this statement it is possible to claim that students have a learning method which is based on memorization of knowledge not mathematical thinking.

Research of Schreglmann (2011) examined the relationship between CT and AA with 74 'information technology' undergraduate students at Çukurova University. "Subject-Based Critical Thinking Program" and classical direct instruction method was applied to the two groups. When the groups were checked, a significant difference was observed in favor of the CT program.

Fahim's (2010) study also searched "the relationship between critical thinking ability and Tofel which is reading section." 83 EFL advanced EFL learners participated to this research. The findings indicated that there is statistically significant advantage for those with greater critical thinking skills. This relation shows high positive correlation between the two variables. Similar research was examined by Villavicencio (2011). Results showed that there is a positive interdependence between CT and AA. Thinking critically is also beneficial for negative academic emotions problem. These students gained less anxious and less hopeless, thereby increasing their achievement. But negative emotions (anxiety, shame, boredom, and hopelessness) had negative correlation with achievement. As parallel this, Karbalaei (2012) made descriptive analysis on the correlation between critical thinking and academic achievement. He states these two variables have a powerful relationship. And they are 21st century skills. For this reason, we can prepare the classroom like discussion rooms. Students must talk to all ideas without any fear of judgment and censure. Teachers can encourage optimal critical thinking behaviors and attitudes at lessons.

Another study was implemented on 60 students of Nursing and Midwifery school. The aim of this study is "to investigate the relationship between critical thinking and academic achievement" by Tafazzoli et al. (2015). The result of this quantitative analysis showed that there was no significant association between the critical thinking disposition and academic success. In this regard there are some reasons that cause this result. According to Tafazzoli et al. (2015) in Iran teaching method is generally focuses on conveying information. Therefore, the students have limited opportunities to discuss and exchange ideas. Also, less intellectual engagement is processed. Another reason of these finding is that the students are interested in analytical tests while university exams had more memory work to evaluate the students' level. As the research of Yadollahi et al. (2013) (as cited in Tafazzoli et al., 2015) the amount of educational materials as well as the methods of evaluation frequently affect the development of critical thinking. In this context evaluation

methods and educational materials which are as based on memorizing, cause students to the memory techniques with limited thinking and reasoning.

Another research related to this topic was conducted by the department of Psychiatry. Mohammadi et al. (2016). The research aimed “the investigating the relationship between critical thinking skills with creativity and academic achievement” among 303 medical sciences students selected from Qom University randomly. Findings demonstrated that there was no a significant correlation between two variables. The CT skills were only predicted significantly by the creativity.

Gültekin’s (2016) study of “The impact of the curriculum design of critical thinking-based teaching principles and methods on learning outcomes”, contains important data about the subject. Totally 75 elementary mathematics students participated in the study. The relationship between CT-based teaching and students' learning level was discussed. According to the results of mixed data analysis, teaching based on CT has a positive effect on students' learning level compared to traditional teaching.

Kölemen (2017) also “the relationship between problem solving and critical thinking skills and academic achievement of vocational and technical secondary school students.” Data collection tools of “Problem Solving Inventory” by Yaman (2003) and “Critical Thinking Skills Inventory” by Özdemir (2005) were used. According to results, it is seen that students’ critical thinking means are  $(X) = 2.98$  and those are closer to the undecided category. This result indicates that students' opinions about having critical thinking skills are undecided. Also there is a positive and strong relationship between CT skill level and AA. In this context, as students' CT skills level increases, AA increases.

Kanbay et al. (2017) also carried out a four-year longitudinal study with nursing students on this subject. For this study “California critical thinking disposition inventory” and “student transcripts” were used. The results indicated that no association found between CT skills and AA. Also, for 4 years the level of critical thinking skills didn’t improve.

Shirazi & Heidari (2019) similarly studied “the relationship between critical thinking and academic achievement” with 139 randomly selected students. The findings of this study indicated that there is no significant association between CT and AA. Also, students’ CT skills score was so low.

In this context, the studies of Mohammadi et al. (2016), Kanbay et al. (2017), Tafazzoli et al. (2015) and Shirazi & Heidari (2019) found the similar results that there is no significant correlation between two variables explained above.

D'Alessio et al. (2019) studied on 1620 executive MBA students. The result of the research showed that critical thinking has a positive impact on the average of students' academic performance at Centrum Católica Graduate Business School. Sisay's (2019) research was on Preparatory School Learners at Woldia University. This study's results were also similar as D'Alessio et al. (2019)'s findings about correlation of two variables. But in this study, level of critical thinking was so low, and students had lack of critical thinking. Moreover, statistics showed that there is a positive relationship between CT proficiency and AA.

In the study of Yüksekbilgili (2019) "the 4th grade students' critical thinking skills and mathematics achievement" were examined. As a result, there is a positive but low-level relationship between critical thinking and mathematics achievement. However, it is significantly to do this study with 4th grade students. Because the 'abstract thinking' skills in primary school students around this age may not be fully developed. Therefore, it is necessary to keep in mind that the results of the research are conducted on children.

Another study conducted by Deniz (2019) with secondary school students examined the critical thinking and academic achievement. School grades were evaluated as academic achievement measurement. The sample consisted of 450 people. In the study, when the relationship between high school students' critical thinking disposition and their academic achievement average was evaluated, it was concluded that the students' who have high level critical thinking disposition have high academic averages. When the sub-dimensions of the scale are examined, it is understood that critical thinking tendency significantly predicts academic achievement in the innovation dimension. The predictive and cognitive maturity subscales of critical thinking tendencies did not significantly predict academic achievement.

Consequently, those studies conducted between 2005-2019 years, showed that mostly the relationship between two variables (CT- AA) is significant and positive. But 4 study found a negative or low relationship. The researchers argue that the negative relationship between two variables (CT-AA) is caused by teaching methods of teachers like memorization-

based. Accordingly, the educators' assessment and evaluation methods directly influence the growth of students' critical thinking abilities. Because to get a high score, the student uses his mind according to the evaluation method of the teacher. In an evaluation based on pure information coding, the student cannot study the topics with a critical mind. Therefore, the skill of critical thinking cannot find a development field depending on the teacher's evaluation methods.

### **2.5.2. The Relationship between Academic Success and Learning Strategies**

This part of study will examine and evaluate the association between learning strategies and academic achievement in the context of previous researches between 2004-2019 years.

Kaydu (2004) investigated the impact of various learning strategies used in geography classes on the achievement of students at the 9<sup>th</sup> high school students. The subject of "structure of the Earth's crust" was prepared with elaboration strategy, but traditional teaching was used for the control group. The experimental group students got higher scores in the academic achievement test than the control group. For this reason, the success of the group in which the lesson was taught by elaboration strategy showed a significant difference.

Actually, there is no strategy used by students here. Teacher explained the lesson by structuring it on the elaboration strategy without including any other strategy. This method resulted in a higher level of learning among students.

Altun (2005) also searched the power of students' self-regulated learning strategies to predict mathematics achievement by gender. 472 students from different faculties taking Mathematics-1 course were chosen as the sample. Academic achievement is based on the semester scores of the participants. The findings of the study show that metacognitive self-regulation, seeking help, time and landscaping, and self-efficacy perception scores were significant predictors of mathematics achievement. Metacognitive self-regulation, self-efficacy perception and time management were effective in the success of males. On the other hand, the strategy of regulating the effort has a positive effect on the success of females. According to this research girls are more diligent than boys on account of effort strategy being decisive in female students.

Bulut (2006), in his research, investigated the effect of learning strategies used in secondary school students' mathematics course on the motivation for success. According to the research findings, students use these strategies at different levels. The most commonly used strategy was concentration, while the least used strategy was processing. Transfer, selection and repetition were also used moderately. On the other hand, according to the research, the strategies used by the students also differ according to gender. In the context of academic achievement, while there is a positive relationship between student success and transfer, selection, processing, and concentration strategies, it is seen that there is no significant relationship between repetition strategy and academic achievement. In this context, students with high mathematics achievement use learning strategies more. Students in the lower achievement group use less. It was concluded that “*successful students use learning strategies effectively.*” This result demonstrates a parallelism with other studies analyzed above in the literature.

Tunçer (2007) investigated the impact of learning strategies employed in teaching on academic success. The learning strategies teaching plan- was created by the researcher. The application lasted about three weeks. Consequently; there was a significant positive difference in favor of the experimental group.

In fact, at this study a learning strategy scale was not used. Alternatively, a directive which is prepared by the researcher together with several experts was followed and the application was conducted after getting the opinions of the teachers. For this reason, it is seen that Tunçer’s (2007) study does not include sub-factors related to learning strategies.

Bozkurt (2007) also examined the impact of learning strategies used in history course on students' academic success. Meaning, organization and repetition strategies were used in the research. Elaboration was applied to group A, organization to group B, and rehearsal strategy to group C. At the end of 12 hours of courses the group’s total achievement was tested. The tests are prepared at the level of knowledge and comprehension. In this context, elaboration and organizational strategies were applied in the classes, and there were significant differences between the academic success of the A and B groups and the success of the C group. The class of which the elaboration strategy was applied achieved the highest success in both knowledge and comprehension levels. Organizing strategy group students achieved a moderate level of success and the traditional repetition strategy

did not reach a significant level of success. In this context, according to the research data, the strategy of elaboration had the highest effect on the success of history course. Rehearsal strategy is an important strategy in learning. But it is seen that using only this strategy has a negative effect on the AA.

Dikbař (2008) conducted a similar research on 5th-grade students in secondary school. The research was carried out with 109 students. Experimental groups were taught learning strategies by the researcher for 10 hours. In the first experimental group, the units were supported by learning strategies and processed by the researcher. The learning strategies used are as follows: Attention strategies, Short Term Memory Storage Enhancing Strategies, Significant Strategies, Memory Supporting Strategies, Recovery Enhancing Strategies, Motivation Strategies, Executive Cognition Strategies. According to the results, a significant difference is seen between the post-test means. It was concluded that teaching LS increases students' AA.

Uyar's (2008) study was conducted with 328 randomly selected students attending 1st year at Faculty of Education. The end of semester scores of two courses, Eđitim Bilimine Giriř and Trkçe-I's mean scores were used as the academic achievement scale. Related to this, there is a positive and significant relationship between the use frequency of learning strategies and academic achievement. However, the relationships are low and medium. It shows that academic success is affected by learning strategies in the range of 4-12%. Meaning and remembering strategies had the high impact on success about 12 percent. Related to this, redi & redi's (2005) regression rate is %30. Alcı et al. (2006) found 17% regression rate about prediction of academic achievement.

Atas (2009), investigated his study on 4th grade students. The research consists of 26 students attending high schools of Keçiren district in 2008-2009 academic year. In the control group, the exercises were trained traditionally, while the lessons of the experimental groups were taught according to the daily plans prepared for Experiment 2 and Experiment 1 groups. The scores of Experiment 2 and Experiment 1 students on mathematics achievement increased significantly. The success of the experimental group 2 ( $x=4.50$ ) is significantly greater than the experimental group 1 ( $x=1.38$ ). The researcher attributed this result to teaching self-monitoring and self-assessment self-regulatory learning strategies which are used in Experiment 2 group.

Diseth & Kobbelt (2010) examined two variables with 229 participants. The results demonstrated that academic achievement (final exam) was positively correlated with strategic learning strategies. In this context, the research supports the idea that AA is based on frequency of LS.

Baklacioğlu (2011) also examined the effects of the strategies used in teaching English on academic achievement in various aspects. The study was conducted on Maltepe Universitesi undergraduate students. An inventory prepared by Oxford (1990) and adapted by Acunsal (2005) was used as the scale of learning strategies. Based on the outcomes of the paper, the students with the highest achievement level (85-100) use metacognitive strategy extensively. Therefore, the graphs in the research show that there is a positive relationship between academic achievement and the repetition of learning strategy usage.

Yusuf (2011) investigated “the impact of self-efficacy, achievement motivation, and learning strategies on students’ academic achievement.” According to the research, self-learning strategies have an indirect effect on academic success.

Yamaç (2011) examined the relationship between mathematics success of 5th grade students and self-regulatory learning strategies. The data collection tools are motivating Strategies in Learning Scale (MSLQ). For academic achievement, mathematics grade point averages were used. Consequently while self-efficacy and motivational beliefs (.60) predicted positively in explaining mathematics academic achievement, test anxiety (-.12) predicted negatively. Learning strategies did not show a significant effect on academic success.

MSLQ scale used in this study is the most comprehensive scale used in studies. Thus, the research provides us more comprehensive and detailed study data. Other significant outcome of this paper was that none of the cognitive and metacognitive learning strategies had a significant effect on mathematics success. Because in most of the previous studies, a significant association was observed between academic success and learning strategies. This outcome may be associated with the point that the research topic is 5th grade students. Because abstract thinking skills in primary school students are partially inadequate. In this context, there may be inadequacies in using cognitive and metacognitive learning strategies.

Ayten (2012) also examined the level of predicting the success of biology lesson by the use of learning strategies. According to the investigation, learning strategies were significant and predictive variables explaining students' success in biology lesson. On the other hand, the predictive power of repetition and evaluation learning strategies were found statistically low level.

The same scale was used in the studies of Ayten (2012) and Yamaç (2011) on biology and mathematics courses. When the prediction of the scale was examined on these two courses, two different results were obtained. The reason for this can be related to the differentiation of target groups. Because Ayten's (2012) study was on high school students, while Yamaç's (2011) study was on 5th grade students in primary school.

In an international conference, Barzegar (2012) expressed the topic of Self-Regulated Learning Strategies in the context of the association between Goal Orientation and Academic Success. For this study 260 first-year psychology students participated and the Motivated Strategies for learning Questionnaire (MSLQ) scale was conducted. Results of the research demonstrated that while using the metacognitive and resource management strategies positively influenced academic success, the application of surface cognitive strategies negatively influenced academic success. In this context Barzegar's (2012) findings, which has negative effect between cognitive strategies and academic achievement, do not support the results of Diseth & Kobbelt (2010), Yusuf (2011) and other research.

Tonguç (2013) examined 8th grade students in secondary school. In his study, he tries to explain "Motivation levels of 8th grade students and self-regulation based learning strategies predicted the power of mathematics success." Motivation and Learning Strategies Scale were used. Researcher found that, motivation levels of students and self-regulated learning strategies explain 47.1% of the variability on mathematics achievement. It was found that students' mathematics success was positively and moderately correlated with all self-regulated learning strategies. Time and working environment factor (33.1%) were found to be the strongest predictor. Self-efficacy perception (7%) was found to be the second strongest predictor. Other significant outcome of the paper is that test anxiety factor has negatively influenced the change in mathematics success.

When the two studies are compared, it is seen that there are similar and different findings. In the both studies of Yamaç (2011) and Tonguç (2013), self-efficacy perception was a strong predictor. Likewise, test anxiety had a negative effect in both studies. As a different finding in both studies; according to Yamaç (2011), learning strategies had no effect on success. However, Tonguç (2013) found the time and working environment factor, which is the sub-dimension of learning strategies, as a most powerful predictor.

Muelas & Navarro (2014) have investigated the topic in the study titled “Learning Strategies and Academic Achievement”. According to results, the relationship between Learning Strategies and Language Academic Performance is not significant for the repetition, attention, metacognitive and socio-affective strategies. But there is a significant relationship between language performance and coding (mnemonic, organizational and development) and recovery (search) strategies.. As the result of research only coding strategy had significant correlation with math achievement. Regarding that; acquisition, recovery and support strategies have not significant relationship with math achievements.

This study shows that some learning strategies have relationship with academic achievement. But some of them are not significant relationship. Also, the results change according to kind of course. However, the study has some limitations like; small size sample (30 people), one location and only male students. These limitations also limited the results of the research.

Sürmeli’s (2015) study is titled “self-regulated learning strategies, epistemological beliefs and the relationship between academic self-concept and mathematics achievement”. From the European side of Istanbul (in 400 schools) randomly selected 10 schools and 630 students were volunteered. In the study, it was discovered that there was a significant correlation between the cognitive strategy use and the success of mathematics lesson of 9th grade students. However, it was found that students' mathematics success was not significantly predicted by the ‘self-regulated’ learning strategies. This finding is parallel with the results of Özüdoğru’s (2013) study on secondary school students. In fact, Özüdoğru (2013) concluded that self-regulation skills do not predict mathematics achievement. In addition, as stated above, Yamaç (2011) concludes that self-regulated learning strategies use could not predict academic success.

Uddin et al. (2016) investigated the topic of motivation and learning strategies as powerful academic success predictors. The findings demonstrated that both motivation and LS variables have positive correlation with academic achievement. When we look at the result of sub-factors meta-cognitive self-regulation learning, organization, time and study environment, and effort regulation positively affect academic success. But elaboration and rehearsal strategies demonstrated negative impact on academic success. Harthy & Was (2010) as cited in Uddin (2016) also found that rehearsal had negative direct effect on academic achievement like that study's result. The researchers of this study explain that actually elaboration and rehearsal strategies are so important for the success, but the limitations of the study caused this result. As a summary, while metacognitive strategies have a positive and significant association with academic success, cognitive learning strategies have a negative correlation.

Güneyli (2016) examined the academic achievement of Grade 6 students in English with self-regulatory learning strategies. The Motivation and Learning Strategies Scale (MSLQ) was used in the research. Consequently, no significant association was observed between self-regulatory learning strategies and academic success of boys and girls. However, a significant positive difference was found between the sixth-grade participants' AA and self-regulatory strategies usage levels. When the items are examined one by one the item of *"I usually work by explaining the topics to someone else in this course"* has the lowest mean.

Çınar (2017) conducted a research on 9<sup>th</sup> grade students' TEOG (central exam) achievement level. The learning strategies inventory developed by Weinstein & Mayer, (1986) was implemented. According to the results, correlation of 0.51 was observed between the scores of the learning strategies scale and TEOG success levels of the participants. Among the strategies, rehearsal was found to have a higher correlation with TEOG success than other strategies. Subsequently, the highest correlation value is related to the strategy of elaboration and monitoring. Similarly, Çelik (2016) also found that 11<sup>th</sup> grade students mostly used elaboration and monitoring strategies. That means the students use high level mental process. The studies of Çelik (2016) and Çınar (2017) showed significantly close results that students are mostly using elaboration and monitoring strategies.

Öztürk (2019) also evaluated the learning strategies of different attitudes. According to the results, there is a significant difference in the application of learning strategy in favor of students with a high level of parental education, independent room and good socioeconomic status.

Alrefaee & Abdul- Ghafour (2019) have investigated the correlation of language academic success and learning strategies among 171 Yemeni EFL University students. Students were randomly selected from the high to low achievers. According to study the results differed depending on low and high achiever students especially in favor of high achievers. While these students' most frequently used strategies are cognitive, compensation, and metacognitive strategies, the least frequently used strategies were affective, social, and memory strategies. Regarding that; in using compensation, metacognitive, and cognitive strategies, there are significant variations among high and low achievers in favor of high achiever students. Therefore, the overall use of learning strategies has a positive relationship with the students' academic success.

In Pakistan there is another study which is on the mediating role of LS on AA. In the research of Shehzad & Aziz (2019) as the measurement tool (MSLQ) was conducted and student's actual semester scores were used as academic achievement predictor. 321 university students consisted the research sample. The results also showed that learning strategies have a positive relationship with academic success.

The previous studies are examined -except 3 research- mostly there found a positive and significant relation between learning strategies and academic success. According to findings metacognitive strategies are more useful than cognitive strategies in learning process. Beside this, not all learning strategies predicted achievement at same level. Because every strategy has considered independently. Therefore, there is no total score about learning strategies. Related this, some of them have negative correlation with academic achievement. In researches mostly the Motivation and Learning Strategies Scale (MSLQ) were used. Also the scale which is developed by Weinstein & Mayer, (1986) and adopted to Turkish by Güven, (2004) was used in the studies. This mentioned scale was used in this research. In studies generally primary school and undergraduate students were chosen as the sample. Researches conducted on secondary school is rare.

## CHAPTER III

### METHOD

In this chapter, the research design, data collection tools, participants, data collection procedure, and analysis of data sections are presented.

#### 3.1. The Research Design

This quantitative research has the characteristics of relational survey design. The survey model is a research model that identifies former or existing circumstances as it is. The relational survey approach tries to discover the presence of a relationship between two or more variables. The relationships through survey model should not be interpreted as a real cause-effect relationship. But it can give some clues about research subject. If the position of a variable is known, it provides some results for estimating the other variable's position (Karasar, 2012). This research's main aim is not to measure the cause and effect relationships, but to measure the predictive power of variables which are explained above.

It was used the relational survey model in this research, which aims to find out the predictive power of learning strategies and critical thinking dispositions in the academic achievement of high school students.

#### 3.2. Participants of the Study

The universe of the research is the students in the high schools affiliated to the Ministry of National Education in Kocaeli province in the 2018-2019 academic year. The sample group included 780 students from 11<sup>th</sup>, 10<sup>th</sup> and 9<sup>th</sup> grades of five different types of schools (Science High School, Anatolian High School, Vocational & Technical Anatolian High School, Social Sciences High school, and İmam Hatip High school). Convenient sampling technique was used to determine the sample of the research.

Also 3 consecutive grade levels were chosen for the reason of investigating the age-related development process of the research topics at students. Students' personel information is given in the Table 8. and Table 9. below.

Table 8. Participants according to school types

Type of Schools	N	%
1.Başiskele Anatolian High School	122	15,5
2.S. Yürekten vocational High School	157	19,9
3.Kocaeli Science High School	170	21,6
4. Ali Fuat Başgil Social Science H. S.	161	20,4
5.Başiskele Anatolian İmam hatip H.S.	178	22,6
Total	<b>788</b>	<b>100,0</b>

Table 9. Participants according to gender

Gender	N	%
Female	353	44,8
Male	435	55,2
Total	788	100,0

### 3.3. Data Collection Tools

In order to collect the data two different scales were used in the research. Learning strategies and critical thinking disposition inventories were used to collect the research data. The information related to academic achievement was acquired from the declaration of the students.

#### 3.3.1. Learning Strategies Inventory

The Learning Strategies Inventory which is used in this study developed by Weinstein & Mayer (1986) and adopted in Turkish by Güven (2008). There are 35 items in the scale. The reliability and validity studies of Güven's scale (2008) were conducted by Çelik (2016). The Cronbach's Alpha reliability coefficient was determined as 0.91 by Çelik (2016).

Accordingly, in the study of Çınar, (2017) conducted on the 9th grade students, the scale reliability coefficient was 0.92. This results show that the reliability of the scale is high. In

the current study Cronbach's Alpha reliability co-efficient value is 0.88 and subfactors values are at below.

<b>Sub-factors</b>	<b>Cronbach's Alpha reliability co-efficient</b>
Elaboration strategy	.75
Monitoring strategy	.82
Organization strategy	.67
Effective strategy	.60
Rehearsal strategy	.83
<b>Total scale</b>	<b>.88</b>

*Table 10. Sub-dimensions of the scale and item numbers*

<b>Sub-factors</b>	<b>Item Numbers</b>
Rehearsal Strategies	32, 33, 34, 35.
Elaboration Strategies	1, 2, 3, 4, 5, 6, 7, 8, 9, 10.
Organization Strategies	19, 20, 21, 22, 23, 24.
Monitoring Strategies	11, 12, 13, 14, 15, 16, 17, 18.
Affective Strategies	25, 26, 27, 28, 29, 30, 31.

### **3.3.2. Critical Thinking Disposition Instrument**

The other scale implemented in this study was the Critical Thinking Disposition Instrument scale developed by Irani et al. (2007) at the University of Florida. The scale was adapted to Turkish by Kılıç & Şen (2014). The sub-dimensions of Engagement, Maturity and Innovativeness in UF/EMI were translated into Turkish. There are 25 items in the scale. The 5-point Likert-type inventory's confirmatory factor analysis (CFA) was conducted on 9<sup>th</sup> and 10<sup>th</sup> grade students to investigate the three-factor structure of the scale. In this study's Cronbach's alpha reliability co-efficient was found 0.92 for total inventory. Also subfactors' reliability coefficients are at below table.

*Tablo 11. Critical Thinking Disposition instrument Cronbach's Alpha reliability*

<b>Subfactors</b>	<b>Cronbach's Alpha reliability co-efficient</b>
Engagement	.87
Cognitive Maturity	.76
Innovativeness	.74
Total scale	<b>.92</b>

*Table 12. The sub-dimensions of the inventory and the items*

<b>Sub-factors</b>	<b>Item Numbers</b>
Engagement	2, 3, 5,7,8,9, 13, 16, 17, 18, 21.
Cognitive maturity	1, 12, 15, 19, 23, 24, 25.
Innovativeness	4, 6, 10, 11, 14, 20, 22.

### **3.3.3. The Personal Information Form**

In the personal information form, the questions related to gender, education level of parents, parents' working status and "Do you have your own private room?" were asked. The question related to the students' grade point averages is also included in this form.

### **3.4. Data Collection Procedure**

The data collection tools of this study were conducted in the 2018-2019 academic year with the getting of permission from Kocaeli National Education Directorate. Appointments were made from high school principals for the implementation dates. At the agreed times, the schools were visited, and the necessary explanations were made to the students by the researcher, and the students were filled in the questionnaires. The inventories were presented to the students together. The implementation lasted approximately 30 minutes in each class. It was applied to two classes from each grade level. The implementations in the classrooms were made simultaneously. Students' academic average scores were obtained

via personal information form with their own expressions. To ensure reliability, some randomly selected students' scores were checked from the e-school system.

### 3.5. Analysis of the Data

SPSS 22 data analysis program was used for the statistical analysis. According to this, multiple regression analysis was used to determine the level of critical thinking and learning strategies. Pearson correlation coefficient, ANOVA, and t-test were also used. For multiple regression analysis, the required prerequisites were provided as shown in the tables below.

Table 13. VIF Values of Variables

Model	Coefficients <sup>a</sup>											
	Unstandardized		Standardized		95,0%		Collinearity					
	Coefficients		Coefficients		Confidence		Correlations		Statistics			
	B	Std. Error	Beta	t	Sg.	Lower Bound	Upper Bound	order	Partial	Part	Tolerance	VIF
1 (Constant)	46,8	3,80		12,31	,00	39,37	54,30					
Elaboration	5,0	,97	,23	5,15	,00	3,11	6,95	,18	,18	,17	,53	1,8
Monitoring	,26	,68	,01	,38	,69	-1,07	1,60	,06	,01	,01	,64	1,5
Organizatton	-	,71	-,19	-4,91	,00	-4,90	-2,10	-,10	-,17	-	,71	1,3
Affective	3,50	,89	,01	,403	,68	-1,39	2,108	,09	,01	,01	,65	1,5
Rehearsal	-1,4	,52	-,104	-2,82	,00	-2,50	-,44	-,06	-,10	-	,80	1,2
CTtotal	5,5	,766	,25	7,19	,00	4,00	7,01	,32	,24	,23	,87	1,1

a. Dependent Variable: Achievement

In order to avoid multiple regression problems in the research, the VIF value should be greater than 10 and the tolerance value should be less than .10 (Çokluk, Şekercioğlu & Büyüköztürk, 2012). According to Table 13., the VIF values are between .14 and .85. It means VIF values are less than 10. Related this tolerance values are also between .53 and .87 that provides the condition of not to be less than .10. The variables' autocorrelation

values are between .01 and .24 that provides the condition of to be less than 0,9. When the skewness and kurtosis coefficients were analyzed for the normality assumption, these values were found to be between +3 and -3. So that multiple regression prerequisites are successfully provided in this research.



## CHAPTER IV

### FINDINGS AND DISCUSSION

#### 4.1.FINDINGS

The findings section includes two subsections. The first subsection is descriptive findings and the second subsection is inferential findings.

##### 4.1.1. Descriptive Findings

*Table 14. School Type of the Participants*

Type of Schools	n	%
1. Başiskele Anatolian High S.	122	15,5
2. S. Yürekten Vocational High S.	157	19,9
3. Kocaeli Science High S.	170	21,6
4. Ali Fuat Başgil Social Science H. S.	161	20,4
5. Başiskele Anatolian İmam hatip H.S.	178	22,6
Total	<b>788</b>	<b>100,0</b>

As shown in Table 15., 15.5% of the participants in the study were from the Başiskele Anatolian High School, 19.9% from Selim Yürekten Vocational High school , 21.6% in Kocaeli Science High School, 20.4% in Social Sciences High School, % 26.6 from Başiskele Anatolian İmam Hatip high school.

*Table 15. Gender of Participants*

Gender	n	%
Female	353	44,8
Male	435	55,2
Total	788	100,0

As shown in Table 16, 55.2% of students are boys and 44.8% are girls.

*Table 16. Grade levels of the Participants*

Grades	n	%
9th grade	274	34,8

10th grade	287	36,4
11th grade	227	28,8
Total	788	100,0

As shown in table 17., 34.8% of the participants are in the 9th grade, 36.4% in the 10th grade and 28.8% in the 11th grade.

*Table 17. Education Status of Parents*

<b>Education Status</b>	<b>n (mother)</b>	<b>%</b>	<b>n (father)</b>	<b>%</b>
Non-school	32	4,1	4	,5
Primary school	250	31,7	131	16,6
Secondary school	182	23,1	177	22,5
High school	177	22,5	256	32,5
Undergraduate	127	16,1	185	23,5
Postgraduate	20	2,5	35	4,4
Total	788	100,0	788	100,0

As shown in Table 18., 4.1% of the students' mothers did not go to school. 31.7% are primary school, 23.1% middle school, 22.5% high school, 16.1% undergraduate, 2.5% postgraduates. 0.5% of the fathers of participants did not go to school. 16.6% are primary school, 22.5% secondary school, 32.5% high school, 23.5% undergraduate, 4.4% postgraduates.

*Table 18. Employment-status of Mothers and Fathers*

<b>Employment Status</b>	<b>n (mother)</b>	<b>%</b>	<b>n (father)</b>	<b>%</b>
Working	229	29,1	736	93,4
Non-working	559	70,9	52	6,6
Total	788	100,0	788	100,0

As shown in table 19., 29.1% of the mothers of participants are working and 70.9% not working. 93.4% of the fathers of participants are working, while 6.6% not working.

Table 19. Having a private room

Private room	n	%
Yes	698	88,6
No	90	11,4
Total	788	100,0

As shown in Table 20., 88.6% of the students participating in the research have their own room, just as 11.4% do not have a room.

Table 20. Students' Academic Success levels

Success Levels	n	%
1	14	1,8
2	96	12,2
3	229	29,1
4	269	34,1
5	180	22,8
Total	788	100,0

As shown in Table 23., 1.8% of the students participating in the research have an average of 1, 12.2% of them 2, 29.1% of them 3, 34.1% of them 4, and 22.8% of them 5.

Table 21. Means and Standard deviations of the learning strategies scale, critical thinking scale and academic achievement

Learning Strategies					
	n	Min	Max	$\bar{X}$	SD
elaboration	788	1,40	5,00	3,5	,64
monitoring	788	1,00	5,00	3,1	,83
organization	788	1,00	5,00	2,9	,76
affective	788	1,00	5,00	3,8	,63
rehearsal	788	1,00	5,00	3,6	,98
A.Achievement	788	0	100	71,4	14,0

Critical Thinking					
	n	Min	Max	$\bar{X}$	SD
Engagement	788	1,00	5,00	3,6	,68

Cognitivematurity	788	1,00	5,00	3,7	,71
Innovativeness	788	1,00	5,00	3,6	,70
CT total	788	1,08	5,00	3,6	,64

As shown in Table 22., According to learning strategies, the lowest mean is organization strategy ( $\bar{X}=2,9$ ) and the highest mean is affective strategy ( $\bar{X}=3,8$ ). Critical thinking subfactors' means are closed each other such as ( $\bar{X}=3.6$ ,  $\bar{X}=3.5$ ,  $\bar{X}=3.6$ ). Students' academic achievement total mean is 71,4.

#### 4.1.2. Inferential Findings

In this section, statistical findings are presented according to the research questions. After that, the findings are evaluated under the title of discussions.

#### 1. What is the predictive power of students' learning strategies and critical thinking dispositions on academic achievement together?

Table 22. Correlations between all variables (Academic achievement, CT scale, and subscales of LS)

		Correlations						
		Achievem	Elaborati	Monitori	Organiz	Affecti	Rehears	CTtot
		ent	on	ng	tn	ve	al	al
Pearson	Achievem	1,0						
Correlati	ent							
on	Elaboratio	,18**	1,0					
	n							
	Monitoring	,06*	,52**	1,0				
	Organizati	-,10**	,47**	,41**	1,0			
	on							
	Affective	,09**	,47**	,43**	,26**	1,0		
	Rehearsal	-,06*	,32**	,24**	,20**	,39**	1,0	
	CTtotal	,32**	,25**	,10**	-,03	,19**	-,01	1,0

\*\*p<0.01, \*p<0,05

Table 23. The Regression analysis of academic achievement on account of variables (LS and CT)

Variables	Unstandardized Coefficients		Standardized Coefficients		Sig.
	B	Std. Error	Beta	t	
1 (Constant)	46,83	3,8		12,31	,00
LSelaboration	5,03	,97	,23	5,15	,00
LSmonitoring	,265	,68	,01	,388	,69
LSorganisation	-3,50	,71	-,19	-4,91	,00
LSaffective	,36	,89	,01	,403	,68
LSrehearsal	-1,47	,52	-,10	-2,82	,00
CTtotal	5,51	,76	,25	7,19	,00

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics		Sig. F	Durbin-Watson		
					Square Change	F Change				
1	,393 <sup>a</sup>	<b>,154</b>	,14	12,9	,15	23,7	6	781	<b>,00**</b>	,94

a. Predictors: (Constant), CTtotal, LSrehearsal, LSorganization, LSmonitoring, LSaffective, LSelaboration

b. Dependent Variable: achievement, \*\*p< 0.01

As seen in Table 24., the predictive power of students' learning strategies and critical thinking dispositions, together on academic achievement were calculated as 15.4%. So those two variables predicted students' academic achievement.

## 2. What is the predictive power of students' learning strategies and critical thinking dispositions on academic achievement separately?

2.a. What is the relationship between the learning strategies and the academic achievement of students?

Table 24. Regression analysis results related to the predictive power of learning strategies on the academic success level of high school strategies

	Beta	Std. Error	$\beta$	t	p	Part r	Partial r
Constant	61,75	3,29		18,76	,00		
Affective	1,24	,91	,05	1,37	,17	,09	,04

Elaboration	6,86	,97	,31	7,03	<b>,00**</b>	,18	,24
Monitoring	,16	,70	,01	,23	,81	,06	,00
Organization	-4,39	,72	-,24	-6,05	<b>,00**</b>	-,10	-,21
Rehearsal	-1,98	,53	-,14	-3,71	<b>,00**</b>	-,06	-,13
R= ,313		<b>R<sup>2</sup> = ,098</b>					
F (5-782)= 16,995		p=0,000					

\*\*p<0.01

As shown in table 25., the predictive power of students' learning strategies on academic success has been calculated as 9.8%. Learning strategies has a predictive power on academic success.

**2.b.** What is the relationship between critical thinking and the academic achievement of students?

*Table 25. Regression analysis results related to the predictive power of critical thinking dispositions on the academic success level of high school students*

	Beta	Std. Error	$\beta$	t	p	Part r	Partial r
Constant	45,6	2,7		16,8	,00		
CT Total	7,0	,73	,32	9,6	,00	,32	,32
R= ,325		<b>R<sup>2</sup> = ,106</b>					
F (1-786)= 93,08		p=0,00					

As shown in Table 26., the predictive power of students' critical thinking dispositions on academic success was calculated as 10.6%. The students's critical thinking skills has a predictive power on academic achievement.

**3. Is there any significant difference between students' critical thinking and learning strategies according to types of high schools (Science, Social sciences, Anatolian, Imam Hatip and Industrial vocational high school)?**

*Table 26. Means and Standard deviations of ED scale and LS subscales according to High School Types*

	School Types	n	$\bar{X}$	SD
CT total	1.Başiskele Anatolian H. S.	122	3,73	,58
	2.S. Yürekten Vocational H. S.	157	3,36	,66
	3.Kocaeli Science H. S.	170	3,86	,47
	4. Ali Fuat Başgil Social Science H. S.	161	3,82	,59
	5.Başiskele Anatolian İmam hatip H.S.	178	3,40	,67
	Total	788	3,63	,64
Elaboration	1.Başiskele Anatolian H. S.	122	3,58	,63
	2.S. Yürekten Vocational H. S.	157	3,35	,72
	3.Kocaeli Science H. S.	170	3,59	,55
	4. Ali Fuat Başgil Social Science H. S.	161	3,60	,58
	5.Başiskele Anatolian İmam hatip H.S.	178	3,61	,66
	Total	788	3,55	,64
Monitoring	1.Başiskele Anatolian H. S.	122	3,14	,89
	2.S. Yürekten Vocational H. S.	157	3,10	,84
	3.Kocaeli Science H. S.	170	3,12	,84
	4. Ali Fuat Başgil Social Science H. S.	161	3,06	,78
	5.Başiskele Anatolian İmam hatip H.S.	178	3,20	,84
	Total	788	3,12	,83
Organization	1.Başiskele Anatolian H. S.	122	3,89	,59
	2.S. Yürekten Vocational H. S.	157	3,64	,77
	3.Kocaeli Science H. S.	170	3,78	,51
	4. Ali Fuat Başgil Social Science H. S.	161	3,82	,58
	5.Başiskele Anatolian İmam hatip H.S.	178	3,86	,66
	Total	788	3,80	,63

Rehearsal	1.Başiskele Anatolian H. S.	122	3,71	,98
	2.S. Yürekten Vocational H. S.	157	3,70	1,02
	3.Kocaeli Science H. S.	170	3,26	,94
	4. Ali Fuat Başgil Social Science H. S.	161	3,49	,94
	5.Başiskele Anatolian İmam hatip H.S.	178	3,91	,89
	Total	788	3,61	,98
Affective	1.Başiskele Anatolian H. S.	122	3,89	,59
	2.S. Yürekten Vocational H. S.	157	3,64	,77
	3.Kocaeli Science H. S.	170	3,78	,51
	4. Ali Fuat Başgil Social Science H. S.	161	3,82	,58
	5.Başiskele Anatolian İmam hatip H.S.	178	3,86	,66
	Total	788	3,80	,63

Table 27. ANOVA results on the students' critical thinking levels and usage of learning strategies according to school types

Subfactors	Source of Variance	SS	MS	Df	F	p	Source of difference
CT total	Between groups	37,2	9,3	4	25,2	,00**	1>2,5
	Within groups	287,9	,36	783			2<3,4
	Total	325,2		787			3>5
							4>5
elaboration	Between groups	7,9	1,9	4	4,9	,00**	1>2
	Within groups	316,5	,40	783			2<3,4,5
	Total	324,5		787			
monitoring	Between groups	1,8	,46	4	,66	,619	-
	Within groups	551,6	,70	783			
	Total	553,4		787			
organization	Between groups	5,7	1,4	4	3,5	,00**	1>2,5
	Within groups	316,2	,40	783			2<3,4,5
	Total	322,0		787			3<5
rehearsal	Between	41,0	10,2	4	11,1	,00**	1>2

	groups						2>3
	Within groups	721,5	,92	783			2<5 4<5
	Total	762,6		787			
	Between groups	5,7	1,4	4			1>2
affective	Within groups	316,2	,404	783	3,5	<b>,00**</b>	2<4,5
	Total	322,0		787			

\*\*p<0.01

According to Table 28, a significant difference was found between schools types according to critical thinking dispositions. Related this, Kocaeli science high school ranked first with the highest average. Then respectively high school of Social Sciences, Kocaeli Anatolian high school, high school of imam hatip and high school of industrial vocational.

According to learning strategies, subfactors are examined independently in the study. In monitoring strategy there is no relationship between school types. But there are significant differences according to the other 4 strategies. In the elaboration strategy; the lowest mean was in the high school of industrial vocational, while the highest mean was found in the high school of imam hatip. In the organizing strategy; Başiskele Anatolian High School has the highest mean and significant difference. High school of industrial vocational has the lowest mean. In the rehearsal strategy; the High school of imam hatip has the highest mean and significant difference. The science high school has the lowest mean. In the affective strategies; Başiskele Anatolian high school has the highest mean and high school of vocational has the lowest mean.

#### 4. What is the correlation between the learning strategies and the critical thinking of students?

Table 28. The correlation between learning strategies and the critical thinking of students

		elaborat ion	monitoring	organizati on	affective	rehearsal
CT total	<b>r</b>	<b>,25**</b>	<b>,10**</b>	<b>,19**</b>	<b>,19**</b>	-,018
	Sig. (2-tailed)	,00	,00	,00	,00	,61
	n	788	788	788	788	788

\*\* , Correlation is significant at the 0.01 level (2-tailed).

The correlation between critical thinking level and learning strategies are shown in the Table 29. According to the table 29., there is a positive and significant low level of correlation between students' critical thinking levels and elaboration strategy ( $r = ,25$ ); positive and significant a low level of correlation with the strategy of monitoring ( $r = ,10$ ); positive and a low level of significant correlation with the organization strategy ( $r = ,19$ ); positive and significant a low level of correlation with affective strategies ( $r = ,19$ ); negative and a low level of correlation with the rehearsal strategy ( $r = -,018$ ).

#### 5. Is there a significant difference between learning strategies according to students' gender?

Table 29. T-test scores, Means and Standard Deviations of Subscales of Learning Strategies inventory according to Gender

Subfactors	Gender	n	$\bar{X}$	Ss	t	Sd	p																																
Elaboration	Female	353	3,6	,57	3,4	786	<b>,00**</b>																																
	Male	435	3,4	,67				Monitoring	Female	353	3,1	,81	5,0	786	<b>,00**</b>	Male	435	3,1	,85	Organization	Female	353	2,8	,70	-,89	786	,37	Male	435	2,9	,80	Affective	Female	353	3,8	,57	-2,3	786	<b>,02*</b>
Monitoring	Female	353	3,1	,81	5,0	786	<b>,00**</b>																																
	Male	435	3,1	,85				Organization	Female	353	2,8	,70	-,89	786	,37	Male	435	2,9	,80	Affective	Female	353	3,8	,57	-2,3	786	<b>,02*</b>	Male	435	3,7	,68								
Organization	Female	353	2,8	,70	-,89	786	,37																																
	Male	435	2,9	,80				Affective	Female	353	3,8	,57	-2,3	786	<b>,02*</b>	Male	435	3,7	,68																				
Affective	Female	353	3,8	,57	-2,3	786	<b>,02*</b>																																
	Male	435	3,7	,68																																			

Rehearsal	Female	353	3,7	,96	2,3	786	<b>,01*</b>
	Male	435	3,5	,99			

\*\*p<0.01, \*p<0.05

According to the Table 30., four strategies have significant differences according to students' gender. Students' learning strategies have a significant difference in favor of females in the elaboration dimension; significant difference in favor of male in the monitoring dimension; significant difference in favor of females in the affective dimension; significant difference in favor of females in the rehearsal dimension.

## 6. Is there a significant difference between learning strategies and critical thinking dispositions according to grades of the students?

Table 30. Means and Standard deviations of CT scale and LS subscales according to Grade Levels

	Grade Levels	n	$\bar{X}$	Ss
<b>CT total</b>	9 <sup>th</sup> grade	274	3,59	,66
	10 <sup>th</sup> grade	287	3,64	,63
	11 <sup>th</sup> grade	227	3,66	,61
	Total	788	3,63	,64
<b>Elaboration</b>	9 <sup>th</sup> grade	274	3,61	,61
	10 <sup>th</sup> grade	287	3,52	,65
	11 <sup>th</sup> grade	227	3,51	,65
	Total	788	3,55	,64
<b>Monitoring</b>	9 <sup>th</sup> grade	274	3,26	,87
	10 <sup>th</sup> grade	287	3,07	,82
	11 <sup>th</sup> grade	227	3,03	,78
	Total	788	3,12	,83
<b>Organization</b>	9 <sup>th</sup> grade	274	3,88	,61
	10 <sup>th</sup> grade	287	3,77	,62
	11 <sup>th</sup> grade	227	3,73	,67
	Total	788	3,80	,63
<b>Rehearsal</b>	9 <sup>th</sup> grade	274	3,64	1,00
	10 <sup>th</sup> grade	287	3,66	,95
	11 <sup>th</sup> grade	227	3,51	,98
	Total	788	3,61	,98
<b>Affective</b>	9 <sup>th</sup> grade	274	3,88	,61
	10 <sup>th</sup> grade	287	3,77	,62
	11 <sup>th</sup> grade	227	3,73	,67

	Total	788	3,80	,63
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Table 31. ANOVA results of students' critical thinking dispositions and learning strategies according to grade levels

Factors	Source of Variance	SS	Df	MS	F	p	Source of Difference
CT total	Between groups	,64	2	,32	,77	,46	-
	Within groups	324,5	785	,41			
	Total	325,2	787				
Elaboration	Between groups	1,7	2	,84	2,0	,12	-
	Within groups	322,8	785	,41			
	Total	324,5	787				
Monitoring	Between groups	8,4	2	4,2	6,0	<b>,00**</b>	9>10,11
	Within groups	545,0	785	,69			
	Total	553,4	787				
Organization	Between groups	3,2	2	1,6	4,0	<b>,01*</b>	9>10,11
	Within groups	318,7	785	,40			
	Total	322,0	787				
Rehearsal	Between groups	3,4	2	1,7	1,7	,17	-
	Within groups	759,1	785	,96			
	Total	762,6	787				
Affective	Between groups	3,2	2	1,6	4,0	<b>,02*</b>	9>10,11
	Within groups	318,7	785	,40			
	Total	322,0	787				

\*\*p<0.01, \*p<0.05

According to the Table 32., there is no significant difference between students' critical thinking levels according to their grade levels. While there is no significant difference in elaboration and rehearsal dimensions according to students' grade levels, there is a significant difference in monitoring, organizing and affective dimensions. In the monitoring dimension, the mean of 9th-grade students is higher than the mean of 10th and

11th-grade students. The mean of 9th grade students in monitoring, organizing, and affective dimensions are higher than the means of 10th and 11th-grade students.

### 7. Is there a significant relationship between parental (Mother) education level and students' learning strategies?

Table 32. Means and Standard deviations of LS subscales according to mother educational level

Mother education level		n	$\bar{X}$	Ss
affective	1. non school	32	3,8	,53
	2. primary school	250	3,8	,68
	3. secondary school	182	3,8	,72
	4. high school	177	3,7	,57
	5. undergraduate	127	3,8	,50
	6. postgraduate	20	3,5	,66
	Total	788	3,8	,63
elaboration	1. non school	32	3,5	,63
	2. primary school	250	3,5	,68
	3. secondary school	182	3,5	,61
	4. high school	177	3,5	,65
	5. undergraduate	127	3,6	,59
	6. postgraduate	20	3,4	,51
	Total	788	3,5	,64
monitoring	1. non school	32	3,2	,73
	2. primary school	250	3,1	,84
	3. secondary school	182	3,2	,85
	4. high school	177	3,0	,83
	5. undergraduate	127	3,2	,82
	6. postgraduate	20	2,8	,81
	Total	788	3,1	,83
organization	1. non school	32	3,0	,78
	2. primary school	250	2,8	,75
	3. secondary school	182	3,0	,79
	4. high school	177	2,7	,73
	5. undergraduate	127	2,9	,72
	6. postgraduate	20	2,7	,88
	Total	788	2,9	,76
rehearsal	1. non school	32	3,6	,73
	2. primary school	250	3,6	1,0
	3. secondary school	182	3,7	,99
	4. high school	177	3,6	,95
	5. undergraduate	127	3,3	,89
	6. postgraduate	20	2,8	1,1
	Total	788	3,6	,98

Table 33. ANOVA results, of learning strategies according to the mother's education levels of students

Subfactors	Source of Variance	SS	Df	MS	F	p	Source of Difference
affective	Between groups	1,9	5	,39	,95	,44	-
	Within groups	320,0	782	,41			
	Total	322,0	787				
elaboration	Between groups	3,6	5	,72	1,7	,12	-
	Within groups	320,9	782	,41			
	Total	324,5	787				
monitoring	Between groups	4,8	5	,97	1,4	,22	-
	Within groups	548,6	782	,70			
	Total	553,4	787				
organization	Between groups	7,0	5	1,4	2,4	<b>,03**</b>	3>4 4<5
	Within groups	451,5	782	,57			
	Total	458,5	787				
rehearsal	Between groups	27,2	5	5,4	5,8	<b>,00**</b>	1>6 2>5,6 3>5,6 4>5,6
	Within groups	735,3	782	,94			
	Total	762,6	787				

\*\*p<0.01, \*p<0.05

As shown in the Table 33., a significant difference is obtained in the organization and rehearsal dimensions regarding the mother' education level. According to this, in organization strategy, the mean of the students whose mothers are middle school graduate is higher than the mean of the students whose mothers are high school graduate ; the mean of students whose mothers are graduates is higher than the mean of students whose mothers are high school graduates. In the rehearsal strategy, the mean of the students whose mothers did not go to school is higher than the mean of the students whose mothers are graduate; the mean of the students whose mothers are primary school graduates is higher than the mean of the students whose mothers are graduates and postgraduates; the mean of students whose mothers are secondary school graduates is

higher than the mean of students whose mothers are graduates and postgraduates; the mean of the students whose mothers are high school graduates is higher than the mean of the students whose mothers are graduates and postgraduate.

### 7. Is there a significant relationship between parental (Father) education level and students' learning strategies?

Table 34. Means and Standard deviations of LS subscales according to father educational level

Father Education level		n	$\bar{X}$	SD
affective	1. non school	4	3,7	,57
	2. primary school	131	3,8	,76
	3. secondary school	177	3,8	,61
	4. high school	256	3,8	,63
	5. undergraduate	185	3,7	,58
	6. postgraduate	35	3,8	,55
	Total	788	3,8	,64
elaboration	1. non school	4	3,3	,75
	2. primary school	131	3,5	,66
	3. secondary school	177	3,5	,65
	4. high school	256	3,5	,64
	5. undergraduate	185	3,6	,61
	6. postgraduate	35	3,5	,62
	Total	788	3,5	,64
monitoring	1. non school	4	2,8	1,20
	2. primary school	131	3,2	,85
	3. secondary school	177	3,1	,83
	4. high school	256	3,1	,82
	5. undergraduate	185	3,1	,85
	6. postgraduate	35	3,0	,79
	Total	788	3,1	,83
organization	1. non school	4	3,0	,55
	2. primary school	131	2,9	,80
	3. secondary school	177	2,9	,76
	4. high school	256	2,9	,75
	5. undergraduate	185	2,8	,74
	6. postgraduate	35	2,8	,82
	Total	788	2,9	,76
rehearsal	1. non school	4	3,6	,74
	2. primary school	131	3,6	1,0
	3. secondary school	177	3,7	,90
	4. high school	256	3,6	,97
	5. undergraduate	185	3,4	,96
	6. postgraduate	35	3,2	1,2
	Total	788	3,6	,98

Table 35. ANOVA results, of learning strategies according to the father's education levels of students

Subfactors	Source of Variance	SS	Df	MS	F	p	Source of Difference
affective	Between groups	,37	5	,07	,18	,97	-
	Within groups	321,6	782	,41			
	Total	322,0	787				
elaboration	Between groups	1,1	5	,23	,56	,73	-
	Within groups	323,3	782	,41			
	Total	324,5	787				
monitoring	Between groups	2,2	5	,45	,64	,66	-
	Within groups	551,1	782	,70			
	Total	553,4	787				
organization	Between groups	1,3	5	,27	,46	,80	-
	Within groups	457,1	782	,58			
	Total	458,5	787				
rehearsal	Between groups	17,6	5	3,5	5,8	,00**	2>5,6 3>5,6 4>5,6
	Within groups	744,9	782	,95			
	Total	762,6	787				

\*\*p<0.01

As shown in the Table 36., a significant difference is obtained only in rehearsal strategy according to father's education level. In the rehearsal strategy, the mean of the students whose fathers are primary school graduates is higher than the mean of the students whose fathers are graduates and postgraduates; the mean of the students whose fathers are secondary school graduates is higher than the mean of the students whose fathers are graduates and postgraduates; the mean of students whose fathers are high school graduates is higher than the mean of students whose fathers are graduates and postgraduates.

**8. Is there a significant relationship between parental (Mother) education level and students' critical thinking dispositions?**

*Table 36. Means and Standard deviations of CT scale according to mother educational level*

<b>Mother education level</b>		<b>n</b>	$\bar{X}$	<b>SD</b>
engagement	1. non school	32	3,1	,79
	2. primary school	250	3,5	,69
	3. secondary school	182	3,5	,74
	4. high school	177	3,7	,57
	5. undergraduate	127	3,8	,60
	6. postgraduate	20	3,8	,51
	Total	788	3,6	,68
cognitive maturity	1. non school	32	3,3	,94
	2. primary school	250	3,6	,74
	3. secondary school	182	3,5	,69
	4. high school	177	3,7	,68
	5. undergraduate	127	3,9	,56
	6. postgraduate	20	3,9	,55
	Total	788	3,6	,71
innovativeness	1. non school	32	3,2	,85
	2. primary school	250	3,4	,71
	3. secondary school	182	3,4	,70
	4. high school	177	3,7	,63
	5. undergraduate	127	3,8	,60
	6. postgraduate	20	3,7	,67
	Total	788	3,5	,70
CT total	1. non school	32	3,2	,79
	2. primary school	250	3,5	,65
	3. secondary school	182	3,5	,66
	4. high school	177	3,7	,56
	5. undergraduate	127	3,8	,53
	6. postgraduate	20	3,8	,47
	Total	788	3,6	,64

Table 37. ANOVA results, of the critical thinking level and its subscales according to mother's education levels of students

Subfactors	Source of Variance	SS	Df	MS	F	p	Source of Difference
engagement	Between groups	23,6	5	4,7	10,6	,00**	1<2,3,4,5,6 2<4,5,6 3<4,5,6
	Within groups	348,5	782	,44			
	Total	372,2	787				
cognitive maturity	Between groups	20,4	5	4,0	8,3	,00**	1<2,4,5,6 2<4,5,6 3<4,5,6 4<5
	Within groups	383,7	782	,49			
	Total	404,2	787				
innovativeness	Between groups	20,9	5	4,1	8,9	,00**	1<2,3,4,5,6 2<4,5 3<4,5
	Within groups	365,1	782	,46			
	Total	386,1	787				
CT total	Between groups	21,6	5	4,3	11,1	,00**	1<2,3,4,5,6 2<4,5,6 3<4,5,6
	Within groups	303,5	782	,38			
	Total	325,2	787				

\*\*p<0.01

As shown in the Table 38., there is a significant difference between the students' critical thinking levels according to the mother education level in all dimensions and in total score. In general, when the level of mothers' education increases, the students' critical thinking levels also increase in total score of the scale.

**8. Is there a significant relationship between parental (Father) education level and students' critical thinking dispositions?**

*Table 38. Means and Standard deviations of CT scale according to father educational level*

<b>Father Education Level</b>		<b>n</b>	$\bar{X}$	<b>SD</b>
engagement	1. non school	4	3,2	,90
	2. primary school	131	3,4	,72
	3. secondary school	177	3,4	,69
	4. high school	256	3,6	,69
	5. undergraduate	185	3,8	,62
	6. postgraduate	35	3,8	,48
	Total	788	3,6	,68
cognitive maturity	1. non school	4	3,2	,79
	2. primary school	131	3,5	,80
	3. secondary school	177	3,6	,74
	4. high school	256	3,7	,70
	5. undergraduate	185	3,8	,63
	6. postgraduate	35	3,9	,45
	Total	788	3,7	,71
innovativeness	1. non school	4	3,2	,76
	2. primary school	131	3,4	,73
	3. secondary school	177	3,5	,68
	4. high school	256	3,5	,69
	5. undergraduate	185	3,7	,67
	6. postgraduate	35	3,8	,54
	Total	788	3,5	,70
CT total	1. non school	4	3,2	,82
	2. primary school	131	3,4	,67
	3. secondary school	177	3,5	,65
	4. high school	256	3,6	,64
	5. undergraduate	185	3,8	,58
	6. postgraduate	35	3,8	,40
	Total	788	3,6	,64

Table 39. ANOVA results, of the critical thinking level and its subscales according to the father's education levels of students

Subfactors	Source of Variance	SS	Df	MS	F	p	Source of Difference
engagement	Between groups	16,9	5	3,3	7,4	<b>,00**</b>	2<5,6 3<4,5,6 4<5
	Within groups	355,2	782	,45			
	Total	372,2	787				
cognitive maturity	Between groups	12,8	5	2,5	5,14	<b>,00**</b>	1<6 2<4,5,6 3<5,6 4<5,6
	Within groups	391,3	782	,50			
	Total	404,2	787				
innovativeness	Between groups	14,8	5	2,9	6,24	<b>,00**</b>	2-5,6 3-5,6 4-5,6
	Within groups	371,3	782	,47			
	Total	386,1	787				
CT total	Between groups	14,7	5	2,9	7,44	<b>,00**</b>	2<4,5,6 3<5,6 4<5,6
	Within groups	310,4	782	,39			
	Total	325,2	787				

\*\*p<0.01

As shown in the Table 40, a significant difference is obtained between the critical thinking levels of the students according to father's education level in all dimensions and total score. As the father's education level increases, students' critical thinking levels also increase both in all dimensions and in the total score of the scale.

## 4.2. DISCUSSIONS

This section includes the conclusions based on the study results. Some suggestions for further studies were included by comparing the studies in the literature.

The main aim of this research was to investigate the predictive power of high school students' critical thinking levels and learning strategies together on their academic success. A regression rate of 15.4% was found in the findings of this research. Accordingly, it can be claimed that 15.4% of students' academic achievement is predicted by critical thinking dispositions and learning strategies.

The predictive power of learning strategies and critical thinking disposition on academic success were evaluated. Accordingly, the predictive power of learning strategies on academic success was found as 9.8%. The predictive power of CT disposition was found as 10.6%.

As explained in first chapter, some research conducted both in Turkey and abroad mostly found a significant and positive correlation between LS and AA. But there are differences in the regression rates of the studies. Çınar's (2017) study found that TEOG achievement had a regression rate of 51%. Altun's (2005) study found 39% regression score. Üredi & Üredi's (2005) regression rate was %30. Alcı et. all (2006) found 17% regression rate. Tonguç's (2013) study predicted 47.1% of mathematics achievement. In this study, the predictive power of LS was determined as 9.8%. This result is low when compared to other studies (eg. Çınar, 2017; Altun, 2005; Tonguç, 2013; Üredi & Üredi, 2005).

This difference may be caused from the imam hatip high school and vocational high school schools in the sample group. Because these schools have curriculum based on practicing and implementing (eg. psychmotor skills). For this reason, cognitive education processes are used less than other schools. The imam hatip school students also use repetition strategies extensively to memorize the religious knowledge. So that, curriculums in these two schools may have decreased the predictive power of learning strategies on academic achievement.

The studies on critical thinking, as detailed in the first chapter, show that, mostly the relationship between two variables (CT-AA) is significant and positive. But a few

found negative or low relationship. In this study, positive correlation and 10.6% regression were found. Looking at the regression rates in other studies; Kayagil (2010) found insufficient CT level and regression rate determined as approximately 12%. In the study of Ayrancı (2011) math regression rate was 5% and SBS (*High School Entrance exam*) regression rate was %21. We can attribute the high regression of SBS to an exam that requires special effort. Kölemen (2017) found a positive and strong relationship. Deniz (2019) found 12% regression rate. It is significant that his regression rate is very close to this study which has same research conditions.

Consequently, when other studies are considered, it is understood that students' critical thinking level is medium or low. It can be claimed that there is no suitable environment for critical thinking (considering regression rates) in schools. Also, teachers' insufficient critical thinking dispositions (eg. Polat, 2014; Aşkar, 2015) might be the reason of this. Another reason of this result may be the teaching methods and examination systems in schools which is based on not questioning but memorization of knowledge.

The difference between school types regarding CT level and LS was examined. Five different school types were examined. A significant difference was determined between schools on account of CT disposition. Accordingly, Kocaeli science high school ranked first with the highest mean. Then consecutively there are high school of Social Sciences, Kocaeli Anatolian high school, high school of imam hatip and industrial vocational high school . There was no significant difference between Science high school and High school of Social Sciences. Likewise, no significant difference was found between the imam hatip high school and vocational high school . In the study of Deniz (2019), the similar results were obtained in terms of school types.

In this context, the industrial vocational and imam hatip high schools have the lowest critical thinking level. . It is possible to say that this result is found because education in high school of industrial vocational is mostly psychomotor skills. However, critical thinking is more related to the cognitive domain. Similarly, the mean of imam hatip high school is low and it is very close to vocational high school. Imam hatip high schools have religious education and their curriculum include dogmatic and pure faith. Therefore, it is possible to associate this finding with the school curriculum that is not suitable for a critical mind.

Science high schools and Social Sciences high school have a cognitive curriculum. The students in the Science and Social Sciences schools are selected with the LGS (High School Entrance Exam) exam. Therefore, it is quite significant that they have a high level of critical thinking disposition.

Significant differences were obtained between schools in terms of learning strategies. In this context, no significant difference was found between schools in the monitoring strategy. In the elaboration strategy, the lowest mean was in the industrial vocational high school, while the highest mean was found in the imam hatip high school. No significant difference was found between the means of other three school types.

In the organizing strategy Başiskele Anatolian High School has the highest score and significant difference. The industrial vocational high school has the lowest score. The scores of the other 3 schools are close to Anatolian high school, and no significant difference was determined between them.

In the rehearsal strategy the highest score and significant difference is in the imam hatip High school. The lowest average is in the science high school. Başiskele Anatolian High school's score is also significantly higher than the industrial vocational high school. The score of industrial vocational High school is higher than the scores of science and Social Sciences high schools. It is possible to explain the high score of imam hatip High school with teaching methods which based on memorization. However, in science high school, there is a teaching process based on interpretation rather than memorization.

In the affective strategy, Başiskele Anatolian high school has the highest score and it is higher than vocational high school. The means of Imam hatip high school and social sciences high school were higher than vocational high school.

Consequently, imam hatip high schools and vocational high schools had a significantly higher mean in the rehearsal strategy. The strategy of rehearsal (repetition) is a simple mental process. Regarding this; Sünbül (1998) found that rehearsal strategy affects success at a lower level than other strategies. In this context, it is possible to relate this result to the curriculum of schools. Because in imam hatip high school, it is important to memorize knowledge, not to question. Also, the curriculum of the vocational high

school provide training on the acquisition of psychomotor skills through the strategy of repetition. So that results are reasonable.

There is a positive and low correlation between CT and LS and its 4 sub-factors as ( $r=0.25, 0.10, 0.19, 0.19, p<0.01$ ). However, a negative and insignificant correlation was found between CT and rehearsal strategy ( $r= -0.18, p>0.05$ ). Rehearsal strategy's negative correlation with critical thinking is an expected result because of its high level thinking feature. Parallel to this research results, Ocak and Bulut's (2017) study found that there is a positive and medium-level correlation between graduate students' critical thinking disposition and their learning strategies.

Pintrich et al. (1993), on the other hand, state that according to researches conducted in American schools, there was found a high positive relationship between critical thinking and learning strategies. However, studies in Turkey and in this research this relationship was found middle and lower levels ( $r=0.25 - 0.10$ ). In this context, it is possible to say that students do not include critical thinking in their learning methods. Thus; low and insufficient level of critical thinking results of the studies of Kölemen (2017), Polat (2014), and Aşkar (2015) support this view.

The relationship between learning strategies and gender variable was examined. According to the findings, no significant difference was determined in the organization strategy. Significant difference was found in favor of males only in monitoring strategy. However significant differences were found in favor of females in 3 strategies as comprehension, rehearsal and affective strategies. In this context, significant difference was mostly determined in favor of female students in the use of learning strategies. Altun (2005) determined that the usage of metacognitive self-regulation strategy has a significant difference in favor of males. Regarding this, Üredi & Üredi, (2005) found that learning strategies have predicted the academic achievement of male by 44% and the achievement of females by 24%. Tonguç's (2013) study found that rate of achievement prediction is 45% in females and 49% in males. The study of Çelik (2016) found significant difference in favor of males. But the means of males and females are close to each other. Öztürk (2019) found that female students use learning strategies more than males in social studies lesson.

In light of related studies, we can conclude that during 2005-2019 years, a significant increase can be seen in the using LS in favour of females. In this study, the rate of using LS was found in favour of females.

According to grade levels, no significant difference was determined between students' critical thinking disposition. Also, Deniz (2019) and Kölemen (2017) have found no relationship between grade levels and CT. In this context, it is possible to point out that CT is a trend. Because, as explained in the chapter I, CT is a tendency that depends on person's habit of mind and characteristic skill, not his age. Therefore, it is an expected result that there is no significant difference between grade levels. Regarding this, it is possible to say that the 3-year education process doesn't get any contribution to students' critical thinking levels.

In terms of learning strategies, there is no significant difference between grade levels (9<sup>th</sup> 10<sup>th</sup> and 11<sup>th</sup>) in the comprehension and rehearsal strategies. However, the mean of 9<sup>th</sup> grade students in monitoring, organizing and affective dimensions is higher than the means of 10<sup>th</sup> and 11<sup>th</sup> grade students. Aydın (2011) found a significant difference between the 10<sup>th</sup> and 11<sup>th</sup> grades.

In this context, 9<sup>th</sup> grade students use their learning strategies more intensively. It is possible to associated this to the intensive course curriculum and rule of class repetition in 9<sup>th</sup> grade. Because in secondary school, unsuccessful students do not repeat the class . But in the 9<sup>th</sup> grade, a student who fails 2 courses repeats the class. So that this situation might be effective motivation for students to work harder in 9<sup>th</sup> grade.

In terms of mother education level, significant difference was determined in organizational and rehearsal strategies of students. According to the findings as the mother education level raises, the mean of the students' organizing strategy increases. But in the rehearsal strategy there is opposite situation. As mother education level decreases, mean of the student's rehearsal strategy increases significantly. It is possible to say that children of the mother with low-education level use rehearsal strategy more. The student gives meaning to knowledge and establishes links of organisation between information packages. It is possible to say that these skills provide a higher level of learning.

Regarding the father's education level, a significant difference was found only in the rehearsal strategy. There is no significant difference in other strategies. While father's education level decreases, the usage of repetition strategy level increases significantly. This finding -related to repetition strategy- is parallel with the finding of mother education level. It would be right to state that students who have high-educated parents, use higher level strategy than others.

In the 7th question, the fact that the education level of the mother affects the strategies used by the student more than the father is a significant finding. Based on this, it is possible to say that mother is more effective than father in the school life of students.

In terms of mother educational level, students' CT levels were examined. According to total scale score, as the education level of mother increases, the students' CT levels also increases. In the same way as the father education level increases students' CT levels also increase. Therefore, it is possible to say that the parental education level is directly related to mental development of the student. This development will also provide the student a healthy progress in all areas of their life.

### **4.3. RECOMMENDATIONS**

In the current study, the learning strategies and students' CT levels were evaluated according to their own opinions. Therefore, the measurement is subjective. In this context, a new study can be done with a mixed method integrating. Related to this qualitative research techniques such as techniques of observation and interview might bring more insight about the subject matter. Also students' level of LS and CT can be measured based on implementations such as scriptwriting and case study. Those experimental studies also determine the effect between relationships of variables.

The high school curriculum can be arranged to be processed criticizing the knowledge instead of memorizing the information. For this, the names of the courses can be changed such as "Reasoning and Argumentation" instead of "Mathematics", "Speaking and Writing skills" instead of "Turkish", "Critical Thinking" instead of "Social studies". Because these course names were determined according to the needs of the 20th century industrial

revolution. Within the scope of 21st century skills; course names should be rearranged according to the skills expected from individuals.

The Ministry of National Education and School should educate students according to current needs. Those who do not understand the reality of today cannot build the future. One of the main necessity for this is that students take life into consideration with a critical mind. Accordingly teachers are one of the most important agencies in teaching critical thinking and learning strategies. Therefore, teacher training policies might be reexamined to make sure that teachers have the sufficient competencies to guide the students on those subjects.



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# APPENDIX

## ÖĞRENME STRATEJİLERİ ÖLÇEĞİ

### Sevgili Öğrenci,

Bu ölçek, ortaöğretim okullarında öğrenim gören öğrencilerin kullandıkları öğrenme stratejilerinin belirlenmesi amacıyla kullanılmak üzere geliştirilmiştir. **Araştırma sonuçları, bu konu ile ilgili araştırmalarda kullanılacak, başka bir amaçla kullanılmayacaktır.**

Ölçek iki bölümden oluşmaktadır. Birinci bölümde sizi tanımaya yönelik kişisel bilgilerin yer aldığı 6 adet soru bulunmaktadır. İkinci bölümde ise, öğrenme stratejileri ile ilgili 35 adet ifadeye yer verilmiştir. Her bir ifadenin karşısında yanıtlama amacıyla kullanabileceğiniz “**bana tamamen uygun, bana oldukça uygun, bana biraz uygun, bana pek uygun değil, bana hiç uygun değil**” biçiminde en olumludan en olumsuz doğru bir derecelendirme ölçeği bulunmaktadır. Her ifadeyi dikkatle okuduktan sonra, ilgili ifadenin size ne ölçüde uygun olduğunu ölçeğin üzerinde ayrılan yere (X) işareti koyarak belirtiniz. Ölçeğin yanıtlama süresi yaklaşık 25 dakikadır.

Ölçeğin yanıtlanması sırasında size en uygun olan seçeneği işaretleyiniz. İşaretsiz ifade bırakmayınız. Ayırdığınız zaman ve ilginiz için teşekkür ederim.

### BÖLÜM I KİŞİSEL BİLGİLER

1. Cinsiyetiniz:

.... Kız ..... Erkek

2. Öğrenim gördüğünüz sınıf:

.... 9. sınıf ..... 10. sınıf ..... 11. sınıf

3. Bir önceki dönem başarı ortalamanız: (.....)

4. Anne ve babanızın öğrenim durumları:

Anne	Baba
.... Okula gitmemiş	.... Okula gitmemiş
.... İlkokul mezunu	.... İlkokul mezunu
.... Ortaokul mezunu	.... Ortaokul mezunu
.... Lise mezunu	.... Lise mezunu
.... Üniversite mezunu	.... Üniversite mezunu
.... Lisansüstü eğitim (Yüksek Lisans/Doktora)	.... Lisansüstü eğitim (Yüksek Lisans/Doktora)

5. Anne çalışıyor: ...Evet ...Hayır

6. Baba çalışıyor: ...Evet ...Hayır

7. Kendinize ait bir odanız var mıdır? ...Evet ...Hayır

		Bana tamamen uygun	Bana oldukça uygun	Bana biraz uygun	Bana pek uygun değil	Bana hiç uygun değil
1.	Ders çalışırken okuduğum konuyu kendi cümlelerimle anlatmaya çalışırım.					
2.	Yeni bir sözcüğü öğrenirken gerektiğinde onu cümle içinde kullanılarak öğrenmeye çalışırım.					
3.	Ders çalışırken konuyla ilgili sorular çıkarır ve onları yanıtlarım.					
4.	Yeni bilgiyi daha önce öğrendiğim başka bir bilgiyle benzerliğini kurarak öğrenmeye çalışırım.					
5.	Çalışma sonunda yeterli düzeyde öğrenip öğrenmediğimi belirlemek için kendime sorular sorar ve yanıtlar veririm.					
6.	Konu başlıklarından yola çıkarak önemli noktaları belirlerim.					
7.	Çalıştığım konuya ilişkin bilgileri zihnimde kısa bir öykü oluşturarak canlandırmaya çalışırım.					
8.	Üzerinde çalıştığım konuyu anlamak için özet çıkarırım.					
9.	Derste önemli gördüğüm ve öğretmenimin vurguladığı noktaları not alırım.					
10.	Okuduğum metinde öncelikle ana düşüncüyü bulmaya çalışırım.					
11.	Ders çalışma saatlerim her zaman günün belli saat aralıklarındadır.					
12.	Ders çalışmaya başlamadan önce neyi, nasıl ve ne kadar çalışacağımı kesin olarak belirlerim.					
13.	Sınavlara hazırlanmanın en iyi yolu günü gününe çalışmaktır.					
14.	Ders çalışmaya başlamadan önce plan yapar ve bu plana göre çalışmaya devam ederim.					
15.	Derslerimle ilgili günlük, haftalık ve aylık planlar yaparım.					
16.	Ders çalışırken dikkatimi sadece çalıştığım konuda yoğunlaştırırım.					
17.	Konulara ait tuttuğum notlar var ise bunları düzenli bir biçimde saklarım.					
18.	Hergün düzenli olarak ders çalışırım.					
19.	Öğreneceğim konuyla ilgili olgular, kavramlar ve örnekler arasındaki ilişkileri gösteren bilgi haritaları (örn; canlı-bitki-ağaç ilişkisi) oluştururum.					
20.	Çalışırken bilgileri şekil ya da çizelge biçiminde düzenlemekte güçlük çekiyorum.					
21.	Metinde öğreneceğim kavramların birbirleriyle ilişkisini gösteren (örn. kök – yaprak ) kavram haritaları oluşturmaya çalışırım.					
22.	Öğrenmem gereken bilgileri ortak özelliklerine göre gruplandırarak öğrenirim.					
23.	Çalıştığım konuyla ilgili fikir ve kavramları basitten karmaşığa doğru sıralayarak öğrenirim.					
24.	Çalıştığım konularda ana düşünce ile yan düşünceleri ayırtmakta zorlanıyorum.					
25.	Konuları sınıfta öğrenmeye çalışırım.					
26.	Derslerde başarılı olmamın kendi çabama bağlı olduğuna inanıyorum.					
27.	Her zaman yeni şeyler öğrenmek hoşuma gider.					
28.	Düzenli olarak ders çalışmanın başarı için gerekli olduğuna inanıyorum.					
29.	Ders çalışırken başarısız olacağımı düşünür ve endişelenirim.					
30.	Çalıştığım ortamda (çalışma masamda, odada) dikkatimi dağıtacak şeyler buldurmamaya özen gösteririm.					
31.	Çalışacağım ortamın kalabalık ve gürültülü olmamasına dikkat ederim.					
32.	Sınavda çıkacağımı düşündüğüm konu ya da konu bölümlerini tamamen ezberlerim.					
33.	Konuyla ilgili önemli bilgileri çıkarıp onları ezberlerim.					
34.	Ders çalışırken tuttuğum ders notlarımı tekrar ederek ezberlemeye çalışırım.					
35.	Bir konuyu öğrenirken ezberlemeyi tercih ederim.					

## "Critical thinking disposition inventory

Sevgili öğrenciler; Bu çalışmada elde edilen veriler, bilimsel amaçla kullanılacaktır. Ölçek maddelerine doğrulukla cevap vermeniz bizim için çok önemlidir. Katkılarınızdan dolayı şimdiden teşekkür ederim.  <b>Öğrencinin;</b> Dr. Hülya ERTAŞ KILIÇ  Adı Soyadı: .....  Sınıfı ve Şubesi:.....		Düşüncenizi uygun kutucuğa  ( X ) işareti koyarak belirtiniz.				
		Kesinlikle katılmıyorum	Katılmıyorum	Kararsızım	Katılıyorum	Kesinlikle katılıyorum
1.	Benimle aynı fikirde olmasalar bile, başkalarının fikirlerini dikkatlice dinlerim.					
2.	Problemleri çözmek için fırsatlar ararım.					
3.	Pek çok konuya ilgi duyarım.					
4.	Pek çok konu hakkında bilgi edinmekten hoşlanırım.					
5.	Çok çeşitli konuları birbiriyle ilişkilendirebilirim.					
6.	Bir öğrenme ortamındayken, pek çok soru sorarım.					
7.	Zor sorulara cevap aramaktan hoşlanırım.					
8.	İyi bir problem çözücüyüm.					
9.	Sorunları çözerken, mantıklı bir sonuca ulaşabileceğimden eminim.					
10.	Bir konu hakkında iyi bilgilendirilmiş olmak önemlidir.					
11.	Problem çözmeyi severim.					
12.	Önyargılarımın kararlarımı etkilemesine izin vermeden, gerçekleri gözönünde bulundurmaya çalışırım.					
13.	Çeşitli sorunları çözmek için sahip olduğum bilgileri kullanabilirim.					
14.	Okulda olmadığım zamanlarda bile öğrenmekten hoşlanırım.					
15.	Fikirlerime katılmayan insanlarla da iyi geçinebilirim.					
16.	Anlatmak istediğimi açık ve net bir şekilde ortaya koyabilirim.					
17.	Bir çözümü açıklamaya çalışırken doğru sorular sorarım.					
18.	Sorunları açık ve net bir şekilde ortaya koyarım.					
19.	Önyargılarımın düşüncelerimi etkiliyor olabileceğini göz önünde bulundururum.					
20.	Doğruya ulaşmak bana rahatsızlık verse bile, bunun için çabalarım .					
21.	Bir konuda doğruyu elde edene kadar, o konu üzerinde çalışmaya devam ederim.					
22.	Problemin doğru yanıtını bulmak için, bildiğim yolların dışına çıkarım.					
23.	Problemlere , birden fazla çözüm yolu bulmaya çalışırım.					
24.	Bir karara varırken pek çok soru sorarım.					
25.	Çoğu problemin birden çok çözüm yolu olduğuna inanırım.					



T.C.  
KOCAELİ VALİLİĞİ  
İl Milli Eğitim Müdürlüğü

Sayı : 99332089/605.01/20475583

21/10/2019

Konu: Araştırma İzni  
( Davut CEYLAN)

YEDİTEPE ÜNİVERSİTESİ REKTÖRLÜĞÜNE  
İSTANBUL

İlgi :19/09/2019 tarihli ve 1041 sayılı yazınız.

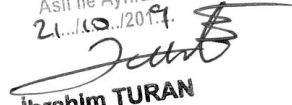
Üniversiteniz Eğitim Bilimleri Enstitüsü Eğitim Programları ve Öğretimi Yüksek Lisans öğrencisi Davut CEYLAN' ın "Farklı Lise Türlerinde Öğrenim Gören Öğrencilerin Öğrenme Stratejileri ve Eleştirel Düşünme Eğilimlerinin Akademik Başarıyı Yordama Gücü" konulu araştırma çalışmasını İlimiz Ortaöğretim Kurumlarında uygulama talebinin uygun görüldüğüne ilişkin, 16/10/2019 tarih ve 20147796 sayılı Valilik Onayı ekte gönderilmiştir.

Bilgilerinize rica ederim.

Osman EKŞİ  
Vali a.  
Vali Yardımcısı

Ek:Valilik Makam Oluru

Güvenli Elektronik İmzalı  
Aslı ile Aynıdır.  
21.10.2019

  
İbrahim TURAN  
V.H.K.I.

Körfez Mah. Ankara Karayolu Cad. No:129 Valilik Binası B Blok Kat:3  
Elektronik Ağ: www.kocaelimem.meb.gov.tr  
e-posta: stratejigelistirme41@meb.gov.tr

Bilgi için: E.SAĞLAM YAVUZ  
Tel: (0 262) 3005871  
Faks: (0262) 32115 54

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T.C.  
KOCAELİ VALİLİĞİ  
İl Millî Eğitim Müdürlüğü

Sayı : 99332089/605.01/20147796

16/10/2019

Konu: Araştırma İzni  
(Davut CEYLAN)

VALİLİK MAKAMINA

İlgi:Yeditepe Üniversitesinin 19/09/2019 tarih ve 1041 sayılı yazısı

Yeditepe Üniversitesi Eğitim Bilimleri Enstitüsü Eğitim Programları ve Öğretimi Yüksek Lisans öğrencisi Davut CEYLAN' ın "Farklı Lise Türlerinde Öğrenim Gören Öğrencilerin Öğrenme Stratejileri ve Eleştirel Düşünme Eğilimlerinin Akademik Başarıyı Yordama Gücü" konulu araştırma çalışmasını İlimiz Ortaöğretim Kurumlarında uygulama talebi, Üniversitenin ilgi yazıları ile bildirilmektedir.

Adı geçenin söz konusu çalışmasına esas olmak üzere, ekte sunulan çalışmayı İlimiz Ortaöğretim Kurumlarında uygulama talebi komisyonumuzca uygun görülmüş olup, İlçe Millî Eğitim Müdürlükleri ve okul müdürlüklerinin denetim ve gözetiminde gönüllülük esasına dayalı olarak çalışmayı yapmaları Müdürlüğümüzce uygun görülmektedir.

Makamlarınızca da uygun görüldüğü takdirde olurlarınıza arz ederim.

Fehmi Rasim ÇELİK  
Millî Eğitim Müdürü

OLUR

<...>

Osman EKŞİ  
Vali a.  
Vali Yardımcısı

Güvenli Elektronik İmza  
Aslı ile Aynıdır.  
24.10.2019  
İbrahim TURAN  
V.H.K.İ.

**Ölçek kullanımı**

2 ileti

**davut ceylan** <davutceylan006@gmail.com>

11 Mart 2019 21:51

Alıcı: "ertashulya@aksaray.edu.tr" &lt;ertashulya@aksaray.edu.tr&gt;

selamlar hocam.. bir yüksek lisans çalışması için "UF/EMI Eleştirel Düşünme Eğilimi Ölçeğini"ni kullanmak istiyoruz. makalenizde (2014) bulamadık. bize göndermeniz mümkün mü acaba. teşekkürler.. iyi çalışmalar  
Davut Ceylan - yeditepe üniversitesi  
eğitim programları ve öğretim

Gmail Mobil'den gönderildi

**Hülya ERTAŞ KILIÇ** <ertashulya@gmail.com>

12 Mart 2019 19:56

Alıcı: davut ceylan &lt;davutceylan006@gmail.com&gt;

Merhaba Davut Bey,  
Türkçe'ye uyarlamış olduğumuz UF/EMI Eleştirel Düşünme Eğilim Ölçeğini tabii ki çalışmanızda kullanabilirsiniz.  
Ölçek ve işinize yarayabilecek belgeleri ekte gönderiyorum.  
İyi çalışmalar dilerim...

Dr. Hülya ERTAŞ KILIÇ

Aksaray Üniversitesi  
Eğitim Fak. Matematik ve Fen Bilimleri Eğitimi Böl.

**ölçek kullanımı**

6 ileti

**davut ceylan** <davutceylan006@gmail.com>

18 Mart 2019 00:33

Alıcı: mguven@anadolu.edu.tr

Merabalar Meral hocam. öğrenme stratejileri ölçeği (2008) i bir yüksek lisans çalışmasında ortaöğretim öğrencileri (9. 10. 11. sınıflar) için kullanmak istiyoruz. sizce sakıncası var mıdır saygılı hocam?  
Davut Ceylan Yeditepe üniv. eğitim programları ve öğretim yl.

**Meral GÜVEN** <mguven@anadolu.edu.tr>

19 Mart 2019 17:00

Alıcı: davut ceylan &lt;davutceylan006@gmail.com&gt;

Merhaba,

ölçeği kullanmanızda sakınca yoktur.

Prof.Dr. Meral GÜVEN



T.C. YEDİTEPE ÜNİVERSİTESİ

SAYI : 75078252-050.01-075 - 184

KONU : Etik Kurul Onayı

24.05.2019

### İLGİLİ MAKAMA

Yeditepe Üniversitesi, Eğitim Bilimleri Enstitüsü Eğitim Programları ve Öğretim Anabilim Dalı Yüksek Lisans öğrencilerinden Davut Ceylan'a ait "Farklı Lise Türlerinde Öğrenim Gören Öğrencilerin Öğrenme Stratejileri ve Eleştirel Düşünme Eğilimlerinin Akademik Başarıyı Yordama Gücü" başlıklı çalışmanın Beşeri Bilimler etik standartlarına uygunluğuna ilişkin Yeditepe Üniversitesi Beşeri ve Sosyal Araştırmalar Etik Kurul Onayı ekte sunulmuştur.

Bilgilerinize rica ederim.

Prof. Dr. Ahmet Aydın

Rektör Yardımcısı

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T.C. YEDİTEPE ÜNİVERSİTESİ

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KONU : Etik Kurul Onayı

24.05.2019

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Yeditepe Üniversitesi, Eğitim Bilimleri Enstitüsü Eğitim Programları ve Öğretim Anabilim Dalı Yüksek Lisans öğrencilerinden Davut Ceylan'a ait "Farklı Lise Türlerinde Öğrenim Gören Öğrencilerin Öğrenme Stratejileri ve Eleştirel Düşünme Eğilimlerinin Akademik Başarıyı Yordama Gücü" başlıklı araştırmasının Beşeri Bilimler etik standartlarına uygunluğu Yeditepe Üniversitesi Beşeri ve Sosyal Araştırmalar Etik Kurulu tarafından değerlendirilmiş ve onaylanmıştır.



Prof. Dr. Suat ANAR

Etik Kurul Komisyon Başkanı

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Eğitim Fakültesi, Bilgisayar ve Öğretim Teknolojileri Öğretmenliği Bölümü

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T.C. YEDİTEPE ÜNİVERSİTESİ

Sayı : 73847808-302.14.04-E.78  
Konu : Beşeri Ve Sosyal Bilimler Etik Komisyonu Hk

YEDİTEPE ÜNİVERSİTESİ REKTÖRLÜĞÜNE

Enstitümüz, bünyesindeki “Eğitim Programları ve Öğretim” Yüksek Lisans programı öğrencisi Davut Ceylan'ın “Farklı Lise Türlerinde Öğrenim Gören Öğrencilerin Öğrenme Stratejileri ve Eleştirel Düşünme Eğilimlerinin Akademik Başarıyı Yordama Gücü” isimli tez-araştırma önerisi ekte olup, ilgili çalışmanın Etik Kurul onay işlemleri için komisyona sevki hususunda gereğini bilgilerinize arz ederim.

Prof. Dr. Servet BAYRAM  
Eğitim Bilimleri Enstitüsü Müdürü

EKLER: Davut Ceyla Hk.pdf

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Bilgi İçin: Gonca BAL  
Telefon No: (0216) 578 00 00

01.04.2019

Sayı:

Konu:Tez hazırlamak için veri toplama izni hk.

Eđitim Bilimleri Enstitüsü M¼d¼rl¼ę¼'ne,

Eđitim Programları ve Öğretim Yüksek Lisans Programı öğrencisi, 20174109003-2D numaralı Davut Ceylan'ın, "Farklı Lise Türlerinde Öğrenim Gören Öğrencilerin Öğrenme Stratejileri ve Eleştirel Düşünme Eğilimlerinin Akademik Başarıyı Yordama Gücü" konulu tezi için gereken verinin toplanabilmesi amacıyla, Kocaeli il sınırları içindeki liselerde ölçek uygulayabilmesi için gerekli iznin alınmasını arz ederim.

Saygılarımla,



Ayşen Köse Şirin

Davut Ceylan -THE PREDICTIVE POWER OF LEARNING STRATEGIES AND CRITICAL THINKING TENDENCIES ON HIGH SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT  
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